The Chemical Age

A Weekly Journal Devoted to Industrial & Engineering Chemistry

VOL. IV. MAY 21, 1921 No. 101

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NOTICES:—All communications relating to editorial matter should be addressed to the Editor, who will be pleased to consider articles or contributions dealing with modern chemical developments or suggestions bearing upon the advancement of the chemical industry in this country. Communications relating to advertisements or general matters should be addressed to the Manager.

The prepaid subscription to "The Chemical Age" is 21/- per annum for the United Kingdom, and 26/- abroad. Cheques, P.O.O.'s, and Postal Orders should be made payable to Benn Brothers, Ltd.

Editorial & General Offices—8, Bouverie Street, London, E.C.4.
Telegrams: "Allangas, Fleet, London." Telephone: City 9852 (4 lines).

The Potash Situation

VARIOUS circumstances combine just now to direct attention once more to the problem of adequate potash supplies. One of these is the persistent effort of our French friends to develop the trade in the Alsatian product. A number of French business men, it is understood, are shortly to visit London with a view to completing negotiations for what is called an industrial entente. France, although now possessing considerable supplies of raw potash, lacks the plant for transforming it into the higher forms of chemicals, of which chloride of potash is the basis. If Great Britain can provide the plant and France the crude potash, there may be built up in this country important potash works of equal value to both countries. Mr. Kenneth H. Chance of the British Cyanides Co., Ltd., whose works are at Oldbury, has recently visited Alsace in connexion with the negotiations now in progress, and the scheme, if carried out, may require the erection of additional works in East Anglia or in Yorkshire.

It was in connexion with this movement for making Alsatian potash better known that a party of French and American journalists recently made a tour of the potash mines in Alsace. The products found in these mines and the processes by which they are worked were described some time ago in THE CHEMICAL AGE by a technical expert of long experience. The picturesque accounts of the visit published in the daily press add little to the existing knowledge of the geology, chemistry, and technology of potash production in Alsace; but they serve the useful purpose of popularising the idea of trade in the article. Perhaps the public will be most impressed by the mere arithmetic of the subject. It is impressive, for example, to learn that there is enough potash in Upper Alsace to supply the whole world for at least 300 years. The formation of the Strassfurt potash beds is estimated to have occupied over 10,000 years, and the Alsace fields are thought to be just as youthful. But, as frequently happens, their discovery was an accident. In 1904—only seventeen years ago—it occurred to a French Alsatian, M. Vogt, that oil or coal might underlie the plain between the Vosges and the Rhine. Perhaps they do. The trial bore, however, failed to reveal them; instead, at about 2,000 ft., the explorers found a saline deposit which analysis proved to contain some 20 per cent. of soluble potash salts. The methods by which these are mined, and since their acquisition by France have been commercially developed, are too familiar to be described in detail. Competent authorities declare the Alsatian deposits to be much superior in chemical composition to their North German competitors. In addition to the Alsatian and German deposits, there are those in Galicia, which have been worked in a small way for some years, as well as at Erythrea in Italy, and the existence of a number of others that have not yet been worked has been recorded. The recently discovered deposits in Catalonia, Spain, are expected to prove quite important. In several parts of the world lakes rich in potash salts have been worked; for example, in Tunis, in Chile, and in the United States. Those in the last-named country occur in Central Nebraska, and produced salts carrying 40,000 tons of K_2O in 1918, the producing capacity being estimated at 50,000 tons, or about one-half of the total producing capacity of the entire United States.

In this country the only practically available source of supply is the flue-dust from blast furnaces. It has long been known, as a writer in *Nature* points out, that this dust contains potash, but the amount was small and very variable, depending largely upon the working of the blast furnace. As the result of a number of experiments initiated by Mr. K. M. Chance, it was discovered that by adding a small proportion of salt to the blast-furnace charge, practically all the potash present could be volatilised as chloride and recovered in the flue-dust. Messrs. Rossiter & Dingley investigated for the British Potash Company the percentages of potash in a large number of iron ores, and published their results in November, 1919. When salt is added to the charge of a blast-furnace smelting these ores, flue-dusts are obtained that contain about 30 or 35

per cent. of K_2O as chloride or other water-soluble salts. Such dust is, therefore, considerably richer in potash than the ordinary manurial salts hitherto supplied from Germany. The experiment of adding salt to the blast-furnace charge has been tried in only a few works, and the bulk of the dust thus produced appears to have been worked up for potash salts at the works of the British Potash Co., Ltd., at Oldbury. In the paper already referred to, it is calculated that if the salt process were adopted in every blast furnace in Britain, potash equivalent to 50,000 tons of K_2O could be recovered annually. This figure is about double that of the British consumption of potash for agricultural purposes before the war, but falls far short of the amount required in this country. There is room, therefore, for the development of this process, and also for increasing imports from abroad.

Overproduction in Dyes

THERE are a number of points of general interest to be gathered from the remarks recently made by Mr. Adolph Hoegger, the chairman of the British Cotton & Wool Dyers' Association. This branch of industry appears in recent months to have been no more fortunate than any other, with the result that few manufacturers have been able to find work for their employees for more than three days a week, contracts for yarn have been cancelled, while claims for late delivery for all sorts of imaginary reasons have become the order of the day. In spite, however, of the rather sorry tale he had to tell, Mr. Hoegger managed to bring out some illuminating facts in connexion with the dye situation.

In the early part of 1920 many colours which were much required were unobtainable, whilst others could only be supplied in very small quantities and at high prices. Shortly after the Sankey judgment, which permitted free imports of German dyes, the Government made it known that some legislation would soon be brought into force prohibiting the import of dyes except under licence, but a whole year passed before this was done. It was only on January 15 of this year that the Dyestuffs (Import Regulation) Bill came into force. During 1920 large quantities of dyes were freely admitted into this country. In addition to the dyes imported through the ordinary business channels, the Government have taken over large quantities of reparation colours from Germany. On account of the abnormal depression existing in the textile trades, the consumption of dyes has been small, and stocks of both British and imported dyes have increased very considerably. According to an official report of the Board of Trade the value of coal tar colours imported into the United Kingdom from all sources during the first 10 months of 1920 exceeded £5,000,000 sterling. Germany is now making dyes at the rate of about 5,000 tons per month, and it has been estimated that the capacity of dye-making in the world is at least double that of the normal consumption.

During the past year British dye-makers have introduced many good and useful colours not previously made in this country. The prices at which vat and other fast dyes are put on the market, however, are still too high to allow of an extensive business being done. With a revival of trade it will be necessary to import many of the finer kinds of dyes in considerable quantities, and it is yet too early to predict what effect the Dyestuffs Act will have upon the textile trades and colour-using industries of this country. Excellent work has been done by British makers, but still much is required to make dye users in this country entirely independent of Germany. Mr. Hoegger concludes that great progress is necessary to enable our textile trades to meet the ever-increasing competition in dyed and coloured woven goods and prints containing the brilliant and fast dyes so much admired and in such great demand all over the world.

The Condition of Business

ALTHOUGH no actual improvement in the volume of business can be reported at present, confidence is certainly stronger than it has been of late. Stocks are running out in many cases, and when trade is liberated from the existing entanglements it is reasonable to expect it to move forward without any great delay. It may be that the period of stagnation through which the chemical trade has recently passed—a longer period than most people had thought possible—has predisposed every one to make the most of any hopeful signs. Allowing for all this, however, there is a growing undercurrent of feeling that the stagnation is nearing the end, and that almost at any moment now an improvement may set in. It is hardly necessary to say how welcome the change will be after the trade's trying experiences since the autumn of last year.

The great obstacle to all improvement at present is still the coal strike. It has dragged on for weeks. Business men and the public generally have accepted the position with a calmness which must make us a puzzle to other nations. The effects are much more visible in the country than in London. Here a visitor would find little to suggest a crisis in industry. In the north, particularly in Lancashire and Yorkshire, the stoppage and unemployment with the consequent anxiety are on a much more notable scale. Yet even there the crowds at the chief Whitsuntide cricket festival were the largest and most eager since before the war. The damage to industry is already enormous, and it is a testimony to our commercial stability as well as to our national self-confidence that the country is standing the effects so well. The situation, however, is too serious to continue.

Unless the miners speedily return, the search for substitutes for coal will be seriously undertaken. Such searches almost invariably end in the discovery of something or other which serves the purpose, and the chemist generally plays an essential part in them. Already a rapid development of the wood distillation industry is urged. Oil is more and more in demand, and we hear of several works adapting their engines for liquid fuel. In spite of the embargo, foreign coal is getting through in sufficient quantities to enable gasworks and similar concerns to carry on. But these for the moment are only make-shifts. The main basis of our industries is still coal, and there is little hope of the recovery we have been for months expecting until supplies are resumed. When these begin once more to arrive, we shall, it is true, not escape the penalties of weeks of idleness, but industry will be in motion again, and trade must presently follow. The general

view in the chemical industry is that within a fortnight of the settlement of the strike the beneficial effects should begin to show. When the improvement once sets in, there is good ground to hope that it will be steady and progressive.

Alcohol from Seaweed

SIR WILLIAM CLARKSON, while lecturing recently before a gathering of engineers in Melbourne, dealt with the favourite topic of oil in a more or less original manner. He agrees with the majority of those who have studied the subject that alcohol can never be produced in sufficient quantities by appropriating foodstuffs and molasses, and suggests that, instead of spending money in endeavouring to start an industry the commercial success of which is doubtful, it would be well worth while seeing what could be done with seaweed as the starting point. Some years ago an investigation was made of an alleged oil deposit found in quantity over a large area in South Australia. This substance, which has been named "coorongite," is a tough substance resembling india-rubber. It occurs in layers of from $\frac{1}{8}$ in. to 1 in. in thickness under the sand. Mr. Marcus Bell, the Commonwealth Superintendent of Laboratories, reported that it "burned with an oily smell, and that, by means of a solvent, 25 per cent. of oily matter was extracted which was of vegetable origin."

There appears to be no definite evidence that it has been originally forced up from any considerable depth to the surface as a liquid, and it has most probably been formed where it is found, resulting from the decomposition of masses of seaweed thrown up on old ocean beaches. This is in a measure confirmed by the presence of small wiry twigs in the body of the coorongite identical, to all appearances, with similar twigs found on the sea beaches intermingled with the seaweed. Sir William Clarkson referred to a number of other facts which afford fair presumptive evidence that natural oil—provided always that it is of organic origin—has been produced from the decomposition of organic material of aquatic origin, and stated that given a suitable ferment and suitable conditions, considerable success might be expected in the production of a liquid fuel from seaweed. This material certainly presents many advantages, for, apart from its limited use for fattening pigs and as a raw material employed in the manufacture of certain cures for obesity, it is turned to no useful account, and is, moreover, available in almost unlimited quantities. The suggestion is worth consideration, even though, at first sight, the chances of success appear somewhat problematical.

Central Profiteering Committee

THE Central Committee under the Profiteering Act was formally dissolved in London on May 10. The Chairman (Mr. John Murray) had a few pleasant things to say about the work of the Committee. First of all, they spent only one-third of the sum allotted to them by the Treasury. This, although only a negative virtue, is, as he claims, a record of which any Government Department might be proud. Then, they completed about seventy reports on direct investigations in regard to industries and trusts These have not been made public, possibly on account of the expense, but according to the chairman they disclose some interesting facts. The committee's investigations have shown that British business is at least as honest as any other department of British life. Big business, the chairman remarked, is always honest, but the combinations with which the Committee have been concerned are great examples of the concentration of power, and for that reason should be watched with careful and continuous inquiry. All this would have been very satisfactory if the chairman had not added a rather alarming statement at the close. "This," he said, "is the Swan Song of the Central Committee. We die in the hope of resurrection next year with greater powers and possibilities of usefulness." There every one will sincerely trust the chairman's hopes may be disappointed. British business is both honest and capable enough to look after itself, without the aid of benevolent committees of inspectors.

26 Per Cent.

MR. CHAMBERLAIN'S statement, in reply to a question by Captain Wedgwood Benn, that while for the present the Government think it inexpedient to repeal or suspend the German Reparation (Recovery) Act, the duty will be reduced from 50 to 26 per cent. has set merchants hoping for some partial relief at least from the entanglements of this Act. In their trust of ministerial statements, some have assumed that the reduction would take effect directly after Mr. Chamberlain's announcement. H.M. Commissioners of Customs, however, cannot be expected to act on answers to Parliamentary questions. They are understood to be charging the full 50 per cent.—or 100 per cent. as it works out in certain cases—and will continue to do so until they receive official instructions to the contrary. At present no definite information is available as to when Mr. Chamberlain's promised reduction will take effect.

The Calendar

May		
25	Society of Chemical Industry: Nottingham Section.	Nottingham.
26	Royal Society of Arts: Papers by Sir A. Ewing; C. D. Ellis, S. Datta; Dr. W. L. Balls; Dr. G. R. Goldsbrough; Dr. H. Jeffreys; T. Kikuchi.	6, John Street, Adelphi, London.
27	Royal Society of Arts: "Industrial (including Power) Alcohol," by Sir C. H. Bedford. 4.30 p.m.	John Street, Adelphi, London.
27	Physical Society. 5 p.m. ...	Imperial College of Science, South Kensington, London.
27	University of London: "The History of Chemistry in the Nineteenth Century," by Sir W. Tilden. 5 p.m.	University College, Gower Street, London.
27	Royal College of Science Union: Chemical Society: "Chemistry of Fibres," by H. F. Clayson.	Royal College of Science, South Kensington, London.

Book Received

THE CHEMISTS' YEAR BOOK, 1921. Edited by F. W. Alack. Manchester: Sherratt & Hughes. Vol. I., 422. Vol. II. 1142.

Manufacture of Motor Spirit by "Cracking" Processes

The following article describes the more important processes by which motor spirit is being manufactured to-day by the pyrolitic decomposition of higher boiling hydrocarbons.

MANY manufactured gasolines are inferior in quality to the natural gasolines by reason of their content of unsaturated hydrocarbons, which often cause the deposition of resinous bodies by polymerisation, and give an offensive odour to the spirit.

Several processes are referred to below which aim at the production of saturated hydrocarbons, but the writer suggests that the most suitable method is one akin to the two-stage process, used by Sabatier and others. In this type of process, the low boiling spirit is first produced by a suitable pyrolytic decomposition of higher hydrocarbons, and the partially unsaturated spirit is subsequently hydrogenated by means of the Sabatier-Sendrens method, with the ultimate production of a saturated, pleasant-smelling and non-polymerisable motor spirit.

It was stated in 1918 that 10 per cent. of the gasoline produced in America resulted from "cracking" processes. There is one principal objection to the use of "cracked" motor spirit, however. Unless the product is carefully refined (which process is considerably more expensive than in the case of natural spirit), and blended in sufficiently small proportions with natural spirit, the olefines and more highly unsaturated hydrocarbons which it contains give the motor spirit a disagreeable odour, and, by oxidation and polymerisation, cause the formation of resinous compounds which colour the spirit, and cause difficulties in the internal-combustion engine in use.

Modifications of the "cracking" process have, of course, been made, and in many cases there is little doubt that the amount of unsaturated hydrocarbons in the product has been considerably decreased. At best, however, the low-boiling hydrocarbons resulting from a cracking operation contain sufficient unsaturated constituents as to cause large losses during refining. The sulphuric acid treatment leads to the polymerisation and therefore the loss of the unsaturated hydrocarbons, and the general difficulties of the operations are conducive to much more serious losses than are encountered in the refining of a natural distillate.

The successful development of a hydrogenation process would solve the problem of economical refining of "cracked" spirit, whilst the operation of the process would return an equal weight of refined, fully-saturated hydrocarbon mixture to that originally used, in contradistinction to the distinctly lower yields resulting from present refining methods.

Practical Processes

"Cracked" motor spirit has been produced for some considerable time by the Standard Oil Co., of America, by means of a process originally patented by Burton, and developed in greater detail by him and other members of the staff of this company. By far the greater part of the American "cracked" gasoline—10 per cent. of the total production in that country—is manufactured by the Standard Oil Co. by these processes. The gasoline obtained is stated to be capable of easy refinement, and a loss of only 1¼ per cent. results in the sulphuric acid treatment. Nevertheless, the final product still contains appreciable quantities of unsaturated hydrocarbons. It is stated by Moureu that American petrol contains relatively large quantities of unsaturated hydrocarbons, in contradistinction to the almost fully saturated nature of the petrol from Asiatic sources.

It was Burton who first succeeded in adapting the known method of "cracking" hydrocarbons by means of distillation in a pressure still, and condensation of the products also under pressure, to large scale production. The heavy distillates of crude petroleum, or the residues remaining after the removal of the gasoline and kerosene fractions, are treated in a still of 8,000 gallons capacity or more, at a temperature of about 400°C. to 450°C., and under a pressure of 4 to 5 atmospheres, created by the gases produced by the greater degradation of the high boiling hydrocarbons, than is necessary for the formation of gasoline. With a carefully regulated speed of distillation, so that the higher boiling, unconverted or partially converted oils, are condensed in the upper parts of the still and are refluxed into the body of hot oil in the still, a distillate is collected under pressure and in a system of fractional condensation apparatus. The fractions of the distillate which are obtained from the air-cooled condensers are re-treated later, whilst the product from the water-cooled condensers is sufficiently "light" to be sent on to the refining vessels. Here it is treated with sulphuric acid in the usual manner, the sulphonic sludge is removed, and the spirit washed with water. A further treatment with strong caustic soda lye and water washing, followed by distillation and rectification in steam heated stills, furnishes the final product in a marketable condition.

The process, as originally patented and worked, was discontinuous, and only 40 per cent. of the still charge could be removed from the still before discharge was necessary, on account of the formation of a coke deposit on the still bottom. This rendered further distillation impossible by reason of the possibility of overheating and localised burning out of the iron plates of the still, which becomes unsafe to work. In later improvements a false bottom of so-called catalytic material was introduced, and the coke was formed upon this series of plates, so that it is claimed that 65-70 per cent. of the charge can be treated before the still requires to be discharged.

Further improvements by Burton and his co-workers rendered possible by this last consideration, concerned themselves in the pre-heating of the raw material by heat exchange, and in the development of a semi-continuous process, which, of course, tended to increased economy of operation.

The still residues, after simple distillation in ordinary stills, if necessary—as in the original process—and the distillates from the air-cooled condensers, are available for re-treatment, and the over-all yield of gasoline from heavy oils is excellent. The final thick black residue of a somewhat asphaltic nature is disposed of cheaply for such purposes as road making and the like.

The high fuel charges which at first burdened the process, and the cost of labour in the discharging and cleaning of the stills, and the relatively large amount of plant required by reason of the slow distillation rate, have been sufficiently reduced by the improved apparatus, so that the production of gasoline for sale in conjunction with natural spirits and as a profit-making proposition has been achieved.

In addition, all the products of the process are utilised. The fixed hydrocarbon gases which are invariably formed, and which escape through a regulable valve placed after the water-cooled condenser, contain small quantities of liquid hydrocarbons. These are recovered by any of the methods which are available in the analogous case of the winning of liquid hydrocarbons from natural gas. These include, of course, absorption in washing oils, compression and refrigeration, absorption by means of highly efficient wood-charcoal, and the like.

The "Petrohol" Process

The "Petrohol" process of Ellis has been in operation at the hands of the Standard Oil Co. for some time. In this process the so-called fixed gases escaping from the "cracking" stills are treated to produce iso propyl alcohol from their contained propylene. The gases contain 5 per cent. of this hydrocarbon in addition to other ethylenic and more highly unsaturated hydrocarbons. The gases are passed in counter current to strong sulphuric acid, whereby the propylene is converted into propyl sulphuric acid. The simultaneous formation of ethyl sulphuric acid from the ethylene, for the ultimate generation of ethyl alcohol, is not effected under the conditions of temperature and acid concentration obtaining. For this latter purpose higher temperatures and more concentrated acid is required, with concomitant polymerisation of some of the unsaturated constituents of the gas, and the production of tarry bodies. When a suitable concentration of propyl sulphuric acid has been produced, it is hydrolysed by means of boiling water, and the propyl alcohol obtained is distilled, to yield finally a constant boiling mixture containing 90·3 per

cent. of the alcohol. "Petrohol" is marketed as a solvent, and is useful for many purposes for which ethyl alcohol is usually employed. Incidentally it is of interest to note that during the war "Petrohol" was oxidised by passage wit oxygen over a copper catalyst to form acetone.

Saturated Hydrocarbons

"Cracked" motor spirit when first produced were very unsatisfactory as compared with the spirit distilled from a good crude petroleum. They were offensive in odour, and, if not already yellowish in colour, they became discoloured in a short time. On further storage, the oxidation and polymerisation of the unsaturated constituents proceeded, and resinous and gummy products separated. These difficulties were to some extent overcome by careful refining, or by the application of new refining processes. The losses occasioned in the refining operations were, however, greater than in ordinary practice, and inventors turned their attention to the development of methods by which saturated hydrocarbons might be produced.

Aluminium Chloride Process

Aluminium chloride is perhaps the only substance which exerts a pronouncedly catalytic action upon the pyrolytic decomposition of petroleum. In the McAfee process (*see* British Patents, 1914, Nos. 22,243 and 22,244) an amount of aluminium chloride varying in quantity up to 8 per cent. of the oil charge in the still is present during the distillation of the raw material. During the "cracking" distillation, the vapours of hydrocarbons boiling above the required point, say, 150°C., are condensed in the upper parts of the still, and are returned, to come once more under the influence of heat in the presence of the catalyst. Under specified conditions of speed distillation, temperature, amount of catalyst and the like, an almost water-white gasoline is obtained in good yield, and requires the simplest refining operations to produce a spirit equal to the naturally distilled variety. Moreover, the still residue after separation from the aluminium chloride, now covered with coke, can be worked up into excellent lubricating oil.

Without considering the process in detail, it is clear that the success in practice depends upon whether the catalyst can be produced sufficiently cheaply, or in default of this, whether a cheap practical process can be evolved for the regeneration of the aluminium chloride catalyst, after its becoming buried in a carbonaceous deposit.

Hall's Patent, No. 1721, of 1913

In this process it is proposed to effect the "cracking" operation in the presence of a catalytic metal of any suitable type, but in the absence of added hydrogen or hydrogen-producing substances. The permanent gases produced by the excessive decomposition of the oil contain sufficient hydrogen fully to hydrogenate the unsaturated hydrocarbons obtained in the pyrolytic action.

The Bergius Proposal

In order to obtain almost completely saturated end products, Bergius, British Patent, 1914, No. 4574, proposed to heat the high boiling hydrocarbon in an atmosphere of hydrogen, at 400°C., and under a superimposed pressure of 100 atmospheres. The low boiling spirit was to be recovered after the operation by suitable fractionation of the mixture from the pressure vessel.

Forward and Rostin attempt the production of saturated hydrocarbons in their process, described in British Patent, No. 107,034. The vapours of a heavy oil are mixed with sulphuretted hydrogen and passed over heated metallic copper. In addition to the decomposition of the high boiling oils and the formation of hydrocarbons suitable for use in internal combustion engines, the sulphuretted hydrogen is decomposed by the copper, the hydrogen combining with the unsaturated hydrocarbons formed in the "cracking," and the sulphur uniting with the copper to form copper sulphide. In a similar manner a low boiling spirit containing unsaturated constituents may be hydrogenated by mixing in the vapour state with sulphuretted hydrogen and passing over copper heated to a suitable degree. By treatment of the copper sulphide with steam, sulphuretted hydrogen is regenerated and re-used whilst catalytic metallic copper is reformed.

Hydrogenation of Unsaturated Spirit

It is scarcely necessary to repeat the considerations which demonstrate the inferiority of "cracked" motor spirit as it often occurs in commerce, nor to emphasise that the production of a saturated spirit would enable a perfect product to be put upon the market without entailing great refining charges. The processes which have been alluded to in the foregoing show the desire on the part of inventors to manufacture a spirit containing as little unsaturated components as possible. The patents considered above constitute, it is true, only a small proportion of the total number of "cracking" processes patented. The majority, however, deal with variation in type of apparatus and not in fundamental conception.

Numerous processes have been suggested, too, for the treatment of the unsaturated mixture from the "cracking" process, in order to remove the colour, odour and to eliminate oxidisable and resin-forming constituents. E. G. Dunstan, in British Patent No. 119,751, proposes to use a small percentage of aluminium chloride which is brought into intimate contact with the spirit to be refined, and a slow distillation is effected. Carbon is deposited upon the aluminium chloride, and the distillate is of good colour, and contains little olefine or di-olefine hydrocarbons.

Two-Stage Processes

It has been suggested upon relatively few occasions that the production of saturated hydrocarbons should be effected in two distinct stages.

Sommer (British Patent, 1913, No. 19,772) described a two-stage process for the production of saturated motor spirit. The heavy oil was to be "cracked" in any of the known apparatus, and after suitably fractionating the product, hydrogenation was to be effected by means of any known catalyst.

A similar method which, however, is more precisely described was patented by Sabatier and Mailhe, in 1914 (British Patent No. 16,971). A finely divided metal, supported upon a non-siliceous mass, acted as catalyst. This stage of the process was carried out at a temperature varying from 400°C. After a time the catalyst became less active owing to the deposition of carbon. The process was, therefore, interrupted and the carbon removed by oxidation in a current of steam or air. Further quantities of the heavy hydrocarbons could then be converted under the agency of the regenerated catalyst, and the process made continuous. The portion of the product which boiled below 150°C. was, however, treated separately in a hydrogenating apparatus. The vapours of the spirit mixed with hydrogen were passed over a reduced nickel catalyst maintained just above 150°C., and the hydrogenated product condensed. The unpleasant odour and the oxidisable constituents of the crude spirit from stage No. 1 of the process had entirely disappeared and the product resembled the low boiling spirit distilled from natural petroleum.

It is suggested that this type of process marks a distinct advance upon any in which the two operations of "cracking" and hydrogenating were to be carried out in one and the same apparatus, and at one and the same time. The reactions are widely dissimilar and require different conditions of temperature, catalyst, &c., for maximum operating efficiency. The pyrolytic decomposition of hydrocarbons can be effected at many different temperatures according to the nature of the material used and of the product desired. Whatever the temperature chosen, however, it is certain to be not less than about 400°C. There is no record, on the contrary, in Sabatier's researches, of a hydrogenation operation being efficiently maintained at such a temperature.

Again, the most successful catalyst for the hydrogenation, namely, finely divided nickel, has not been shown to possess maximum efficiency in the furtherance of the pyrolytic decomposition of heavy oil.

Finally, from a consideration of the application of Le Chatelier's theorem to the two reactions, it is clear that *decrease* of pressure tends to further the "cracking" operation (as a greater volume is produced on reaction), whilst an *increase* of pressure is required to accelerate the hydrogenation where reduction in volume takes place.

The actual process of hydrogenating a low boiling hydrocarbon distillate should present little practical difficulty, and costs should be relatively small, considering that a great saving would result in refining operations, even supposing that such treatment is necessary after hydrogenation.

In the case of spirits derived from certain sulphur con-

taining natural oils, the possibility of the existence of sulphur compounds in the " cracked " spirit should not be overlooked. The poisoning action of such bodies upon the nickel catalyst is too well known to require comment, and sulphur compounds must be removed before attempting to hydrogenate the spirit over reduced nickel.

Vapour Hydrogenation

Hydrogenation of substances in the vapour state is unlikely to cause any great difficulty in practice. The fact that acetaldehyde has been successfully converted into ethyl alcohol by catalytic hydrogenation over reduced nickel, on a large technical scale, is proof of this. Apparatus which might be of satisfactory type for the hydrogenation of " cracked " spirit on a commercial scale is described at length in the Patent Specifications of the Dayton Metal Products Co., of America (British Patents, Nos. 133,666 and 150,991).

These specifications relate to the hydrogenation of benzene to cyclohexane, but the problem is essentially the same as that of the treatment of " cracked " fractionated petroleum spirit. The vapours of the material to be hydrogenated are mixed with hydrogen in definite proportions and pumped under a high pressure, 300 lbs. per square inch, through the reaction space. This consists of a tube into which is fitted, in a gas-tight manner, a " cartridge " to contain the reduced nickel catalyst, and so adapted that when the catalyst has lost its activity the cartridge may be quickly and easily withdrawn, and a second containing new or reactivated catalyst substituted.

Many other minor problems would undoubtedly arise in large scale practice, but there is no fundamental difficulty to be met.

Thus, it is suggested that the most satisfactory manufacturing method for the production of motor spirit which is so urgently needed, is by a two-stage process. In the first, a cheaper distillate of natural petroleum is pyrolytically decomposed in the best type of " cracking " apparatus, with the formation of low boiling hydrocarbons, necessarily unsaturated,—so far as we know at present. In the second stage of the process, the fractionated product from the first stage is hydrogenated (after suitable purification from sulphur compounds, &c., if necessary), by passing the hydrocarbon vapours mixed with hydrogen over a reduced nickel catalyst.

The final product, similar in all respects to natural petrol, would be of good colour and odour, would be permanently stable, and would not deposit resins and the like upon storage. There would be, moreover, no tendency to carbon deposits in the internal combustion engine, due to incomplete combustion of ethylenic hydrocarbons.

Indian Chemical Industries

Important Developments Proposed

AT the recently held inaugural meeting of the Indian Institution of Engineers, a long discussion was devoted to the possibility of manufacturing certain chemicals on a large scale in India. From a study of the raw materials available it is thought that there are considerable prospects for the development of the industry provided that electricity can be obtained sufficiently cheaply. Such products as calcium carbide, aluminium, cyanamide and various nitrogen products, ferro-alloys, chlorine, caustic soda, magnesium and phosphorus are said to be the most promising lines for development.

It appears that the calcium carbide and nitrogen products industry is particularly worthy of investigation by reason of the large quantities of raw materials available in India and of the markets, both existing and possible, in India and adjoining countries for the complete series of products. There is, it is stated, a potential market for 32,000 tons annually of nitrolin, to be used as manure on tea estates in India, after making due allowance for the fact that Indian soils generally are not deficient in nitrogen.

For ammonium sulphate the prospect is said to be even brighter, for it has been estimated that more than 100,000 tons could be disposed of annually to sugar planters in Ceylon, Java and Japan, and inferentially there is a possible market for nitrogen fertilisers for sugar in India.

Research in Agriculture

The Rothamsted Experimental Station

ON May 14, the Members of the House of Commons Agricultural Committee paid a visit to the Rothamsted Experimental Station, where they were received by Lord Bledisloe, the chairman of the Committee of Management ; Professor H. E. Armstrong, the Vice-Chairman ; and Dr. E. J. Russell, the Director. The visitors spent the whole day in an examination of the fields and laboratories, after which the Members of Parliament expressed their astonishment at the almost incalculable value of the research work now being carried on there.

Recent experiments have been undertaken with a view to ascertaining the manurial requirements of wheat, and also in regard to various artificial manures. In the laboratories the visitors saw in progress the manufacture of artificial farmyard manure, which it is claimed is a satisfactory means of utilising straw when its marketable value is small. Apart from the straw, the cost is stated to be 5s. 6d. per ton ; from 1 ton of clean straw 3½ tons of manure can be produced.

The Faraday Society

THERE will be a general discussion on " Physico-Chemical Problems Relating to the Soil," at the rooms of the Chemical Society, Burlington House, Piccadilly, W.1, on May 31st. The chair will be taken by Sir A. Daniel Hall, K.C.B., and the afternoon session, which is from 4.30 to 6.30 p.m., will consist of " A General Survey of the Subject," by Dr. E. J. Russell ; the following papers on soil moisture : " The System Soil—Soil Moisture," by B. A. Keen ; " The Soil Solution in Relation to the Plant," by Professor D. R. Hoagland ; and " Activity and Imbibition in Relation to Soil Moisture," by Dr. C. A. Shull. The second part of the session will be devoted to Organic Constituents of the Soil; the following papers will be read :—" The Part Played by Organic Matter in the Soil System," by H. J. Page ; " The Application of Physico-Chemical Methods to the Study of Humus," by Professor Sven Oden ; and " The Vertical Distribution of Soil Acidity in Natural Soils and its Relation to the Organic Constituents," by Dr. E. J. Salisbury.

At the evening session, which will be held from 8.0 to 10.30 p.m., the first group of papers on Adsorption Phenomena will include " The Phenomena of Absorption in Soils : a Critical Discussion of the Hypotheses put forward," by E. A. Fisher ; " Soil Acidity in its Physico-chemical Aspects," by E. M. Crowther ; and " Pan Formation," by C. G. T. Morison. The concluding group, on Colloidal Phenomena, &c., will comprise the following papers :—" The Clays as Disperse Systems," by Professor Sven Oden ; " The Mechanism of Flocculation in Soils," by N. M. Comber ; " Plasticity of Clay," by Dr. J. W. Mellor ; and " The Physical Properties of the Soil in Relation to Survey Work," by G. W. Robinson.

International Rubber Exhibition

THE fifth International Exhibition of Rubber, other Tropical Products, and Allied Industries will be held at the Royal Agricultural Hall from June 3 to June 17. Sir Owen Philipps, M.P., is the hon. president of the exhibition, and Professor W. R. Dunstan, Director of the Imperial Institute, is the hon. vice-president. The organising manager is Mr. H. Greville Montgomery. Already 40 British and foreign countries and over 50 associations and firms have secured space. The exhibits include rubber manufactured articles, reclaimed rubber, compounding ingredients, machinery, all tropical raw materials, and goods manufactured from them, new inventions and processes. International congresses will be held during the exhibition.

Appointment for Mr. Woolcock, M.P.

WHEN the Ministry of Munitions was wound up and Lord Inverforth left the Government, Mr. W. J. U. WOOLCOCK, M.P., general manager of the Association of British Chemical Manufacturers, also resigned his position as Parliamentary Private Secretary to the Ministry of Munitions. Mr. Woolcock has now been appointed Parliamentary Private Secretary (unpaid) to the Postmaster-General.

A High Speed Grinding Machine

HIGH-SPEED grinders are being used in ever-increasing numbers not only in chemical works but in numerous other industries, and it will be of interest to those connected with the chemical trade, &c., to give details of a machine which it is claimed

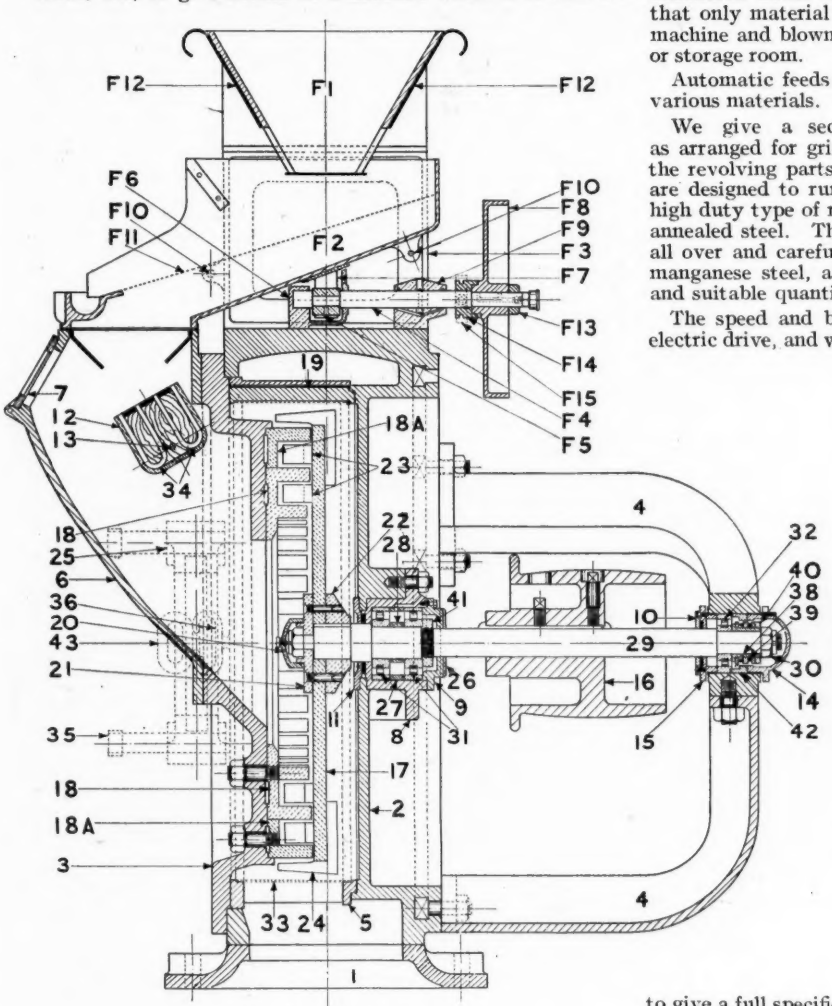

FIG. 1.

will reduce a large range of materials into various degrees of fineness in one operation, in a simple and cheap manner. As our readers are aware a large number of pulverisers are working in various British factories, and the demand is being met to a large extent by productions from America, where the matter of grinding has received more attention than in this country. The following description is of a British machine of distinctive design for which the makers claim many advantages, chief among them being its low price. The machine is the "Impact" Grinder, made by W. S. Barron & Son, Ltd., milling and grinding engineers, Gloucester.

In a dust-tight closed body a rapidly-rotating disc is fixed. This disc is provided with a number of steel projections or beaters concentrically arranged, which revolve between fixed slotted rings which extend close up to the revolving disc.

These rings are of peculiar construction and design to give the best grinding results. They are provided with slots for the material to pass through, the inner ring slots being larger than those in the outer ring. The material is therefore reduced in stages, and finally comes in contact with the screen. Material fine enough passes away from the machine; any material not fine enough is delivered back into the feed spout through an ingenious port, and mixing with the feed is ground again.

The above description represents the action of the machine when working on grinding with screens down to 1/64 in. mesh.

When, however, the grinder is intended for much finer work such as for the production of finenesses from 100 to 200 mesh, the screens are replaced by chilled iron linings and a fan is connected direct to the grinder with its suction to ensure that only material of the desired fineness is sucked from the machine and blown into a dust collector connected to the bin or storage room.

Automatic feeds are fitted to the grinder for dealing with various materials.

We give a sectional view of an "Impact" Grinder as arranged for grinding through 1/64 in. mesh screens. All the revolving parts are carefullly balanced and the machines are designed to run without vibration. Bearings are of the high duty type of roller bearing, spindles being of high grade annealed steel. The revolving disc is of mild steel machined all over and carefully balanced. Beaters are of best quality manganese steel, all parts being machined and made to jig and suitable quantities of spares carried in stock.

The speed and balance of the machine well adapts it for electric drive, and we understand that the makers are prepared

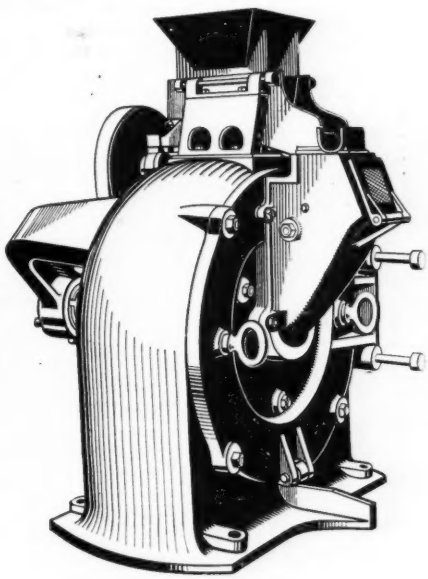

FIG. 2.

to give a full specification and quotation for their various sizes of "Impact" Grinders direct coupled to electric motors, or for the grinder only.

Japanese Chlorate of Potash

Remarkable Decline in Production

ALTHOUGH the manufacture of chlorate of potash was started in Japan in 1910 the production was so limited that most of the demand had to be met by imports, which before the war amounted to more than 4,500,000 lb. The abnormal conditions brought about by the war, states the *Yakugyo Shuho*, resulted in the development of the chlorate of potash industry, until in 1916 the imports had dwindled to 1,282,500 lb. This rapid growth continued, so that before long there was an exportable surplus after meeting all home needs. In 1917 production amounted to 13,294,721 lb., and in the following year to 11,000,000 lb.

With the conclusion of the Armistice, however, the production of potash began to decline, and this tendency was steadily accentuated by the great rise in price of all commodities and in wages. As this tendency continued to grow in 1919, many of the manufacturers either suspended work or were obliged to discontinue the industry entirely, so that in 1920 the production amounted to only 6,500,000 lb.

Reviews

ANNUAL REPORTS OF SOCIETY OF CHEMICAL INDUSTRY. 1920. Vol. V. Pp. 626. 8s. 3d. to members, 15s. to non-members.

In the review of the Annual Reports for 1919 which he contributed to THE CHEMICAL AGE last July the writer remarked that "from the standpoint of bulk and utility the volume continues to progress." The same does not quite apply to the volume for 1920, for, although from the standpoint of utility it comes up to the usual high standard expected of it, the bulk is slightly less than last year. Bearing in mind the progressive growth of the first four editions, one visualised the publication, in ten years time, of a mammoth volume approaching the dimensions of the London Post Office Directory. Fortunately, however, it would seem that the editor appreciates that there is a stage of finality in this direction, for the one thing which the present-day busy reader abominates is a reference book which defies all the rules of portability and accessibility. As it is, the volume provides a wonderful fount of knowledge of recent developments for the comparatively small sum charged for it. It is, in fact, the worst testimonial the Society could possibly issue in support of its contention that financially it has recently been labouring under embarrassed circumstances.

It will be wholeheartedly agreed that, while the individual compilation of a series of Reports calls for a great deal of work and an immense amount of searching through the current literature of all countries, the onus of ensuring success mainly falls upon the directing mind which has to co-ordinate all the sections and preclude the various contributors from wandering into the preserves of their fellow-workers. The task is by no means an enviable one; and, even if chemical omniscience can never be attained by a single individual, something very nearly approaching it must be demanded of the editor of a volume such as this. For this reason the reviewer feels that attention should primarily be drawn to page 3, where in modest seclusion at the end of a list of contributors lies buried the name of the man who deserves the lion's share of approbation. This, as is well known to many, is the name of the editor, Mr. T. F. Burton. His share of the burden is necessarily not appreciated by the casual reader; and, briefly, perhaps the best illustration of the manner in which he detects anything in the nature of the inaccurate is the last page of the book, where appears an erra list (for the previous volume) dealing with corrections to only two pages out of a total of over 600. Even these inaccuracies are of little moment, for they merely refer to the tra sition of the initials of two authorities bearing the same ame.

When originally published in 1916 15 different sections were covered in the volume, whereas in the current edition the number has risen to 27, or one fewer than in the previous year. Actually, however, the number of subjects dealt with is the same as last year, for in the 1919 volume there were two "Fermentation Industries" reports, namely, for the years 1918 and 1919. It cannot be said that the original policy (framed so as to get authoritative statements from different view-points) of putting each subject into the hands of a different writer each year has been very energetically pursued; for of those who contributed to the 1919 volume the following had charge of the same subject in 1920: Plant and Machinery (Dr. W. B. Davidson), Mineral Oils (Dr. A. E. Dunstan), Colouring Matters and Dyes (Mr. F. M. Rowe), Fibres and Paper (Mr. S. Napper), Acids and Alkalis (Mr. Thomas Ewan), Leather and Glue (Mr. F. C. Thompson), Agricultural Chemistry (Dr. Russell), Sugar and Starches (Mr. J. P. Ogilvie), Fermentation Industries (Messrs. Tait and Fletcher), Foods (Dr. H. W. Bywaters), Fine Chemicals (Dr. T. A. Henry), Photographic Materials (Mr. R. E. Crowther), Explosives (Mr. Wm. Rintoul), and Analytical Chemistry (Mr. C. A. Mitchell). Thus more than half of the reports are contributed by those who were engaged for the same purpose in the previous year. The point is drawn attention to here, not because any criticism of the material and facts included can possibly be made, for the records are a model of completeness throughout, but the policy requires to be kept under restraint. As a matter of fact the duties of a contributor are no sinecure, and members of the Society as a whole should view with gratitude the self-sacrificing spirit of those who carry out this work with no thought as to the pecuniary reward. At the same time, there is a certain amount of credit attached to the work, for none but accepted authorities are considered. In some subjects the choice of authors is, of course, woefully limited, and as an illustration one might quote agricultural chemistry. It is, in fact, a matter for congratulation to know that Dr. Russell has now burdened himself with all the reports yet published on this subject.

The Fuel report has been contributed by Professor J. W. Cobb and Mr. H. J. Hodsman, who draw attention to the fact that the whole question was dominated by the continued and almost world-wide shortage, and there are small grounds for hope that the days of cheap and abundant fuel are to return. An ideal process for dealing with coal must satisfy three requirements, namely, (1) the heating value must be applied with the maximum thermal efficiency, (2) the operation must cause a minimum of atmospheric pollution, and (3) the chemical value of the fuel must be utilised as well as possible, having regard to all circumstances. Never has so much attention been focussed on all these points as now is the case both in the laboratory and in industrial practice. On the other hand, the contributors might have drawn attention to the apathy which the average industrial consumer displays towards the suggestions and recommendations made by academic workers. It is noticed that reference to the new Gas Act is made by both fuel and gas contributors; and, although the overlapping is not serious, it would seem that this is a matter which might well have been left to the gas contributor alone. On the subject of petroleum exhaustion, Dr. Dunstan points to the fact that production in the United States must pass its peak at an early date, and that experts believe the most conspicuous development of new sources will occur in countries bordering the Caribbean Sea and the Gulf of Mexico. It is anticipated that petroleum will constitute the basis of a chemical products industry which will eventually be as distinct in scope and activity as the coal-tar industry now is. Meanwhile, one cannot but help being struck by the remarkable developments which are occurring in the theory and practice of lubrication.

The difficulties besetting the dye industry are concisely dealt with by Mr. F. M. Rowe, and it is instructive to learn from him that the production merely of standard pre-war dyes is by no means the ultimate object of the British colour industry, for the nation that plays the most important rôle in new achievements is the one which will eventually triumph. To this end organised research (which should be subsidised) is imperative. Reference is made to the activity of the Chemical and Dyestuffs Traders' Association in matters of the kind. Unfortunately, it is a particularly difficult task to give in a brief space a comprehensive review of a series of reviews; accordingly, a great deal of interesting material has, perforce, to be passed over. Whatever his particular branch of activity, however, no chemist, be he pure or industrial, can afford to miss the opportunity of equipping himself with the really up-to-date facts which the volume contains. It is noted that THE CHEMICAL AGE once more makes its appearance amongst the list of authoritative literature quoted.

A. M.

RELATIVITY AND THE ELECTRON THEORY. By E. Cunningham. 2nd edition, 1921. London: Longmans, Green & Co. Pp. 148. 10s. 6d.

The special principle of relativity relating to the measurement of length and time first propounded by Einstein in 1905 was extended some ten years later to a general principle, including the phenomenon of gravitation, which has culminated in a theoretical deduction of the correction for the observed motion of the perehelion of Mercury and the anticipation of the observed deflection of the light rays passing through the gravitational field of the sun.

In the first portion of this volume the author introduces the arguments and experiments which led to the adoption of the special principle of relativity, the combination of the two postulates of which has led to such interesting results. A brief description and mathematical treatment of a few of the more important experiments undertaken to detect the ether drift round the earth is given, including those of Fizeau and those commenced by Michelson.

The actual concept of an ether is now rejected, and the Fitzgerald-Lorentz transformations introduced to explain the

apparent anomaly resulting from a study of the supposed ether drift.

Of the two Einstein postulates, the first is generally accepted, being originally due to Newton stating the impossibility of measuring or detecting absolute translatory motion through space; in the second the constancy of the velocity of light and its independence of the motion of the emitting source is assumed. There are still a number of physicists, including Sir O. Lodge, who do not accept the Einstein principle, and a brief discussion of the various emissive theories of light, especially that of Ritz, would not have been out of place at this point.

The development of the Fitzgerald-Lorentz interpretation of the Michelson Morley experiment naturally leads to an examination of the electron theory of matter, and a brief summary of the experimental evidence for the contracting electron is included, and shown to conform to the general hypothesis of relativity. The first portion of the book, pp. 1–86, concludes with a chapter on Minkowski's four dimen ional vectors, which are most convenient for graphical representation of kinematical events.

In the second portion of the book Einstein's general theory of relativity is discussed, together with Weyl's theory of electricity. The motion of a planet of Mercury, *e.g.*, in the field round the sun and the deflection of light in a gravitational field, are discussed, and the calculated results are shown to agree remarkably closely with the experimental data. The possibility of the shift of the spectrum in a gravitational field is briefly alluded to. Although a great number of lines, especially those of cyanogen, in the sun's spectra have been examined, no shift toward the red end of the spectrum has been observed. The premise of a shift naturally rests on the hypothesis that vibrating atoms may be regarded as little clocks emitting light of a particular period. A shift in the spectrum line of the light from positive rays of high velocity towards the red end of the spectrum compared with the stationary light emitted from atoms should be capable of experimental observation. The section closes with a survey of Weyl's hypothesis and a comparative survey of the development of the principle of relativity.

An interesting and valuable book for those who possess some mathematical equipment.

ERIC K. RIDEAL.

THE PHYSIOLOGY OF PROTEIN METABOLISM. By E. P. Cathcart, M.D., D.Sc., F.R.S. Longmans, Green, & Co., 1921. Pp. 176. 12s. 6d. net.

A hearty welcome must be extended to the new edition of Professor Cathcart's monograph on the Physiology of Protein Metabolism. The work started by Liebig, Voit, Pflüger, Zuntz, Rübner and their pupils has been steadily carried on during the past 20 years, and since the last edition (1912) so much has been done, particularly in America by Lusk, Van Slyke, Folin, Mendel, Osborne and other workers, that it has been necessary not only to bring the material up to date, but entirely to re-write several sections. A final chapter summarizing the influence of non-nitrogenous foodstuffs on the metabolism of protein has been added. We are glad to note that the author has exploded the fiction of speaking about the possibility of replacing fat and carbohydrate in isodynamic amounts in the diet over the whole range of replacement. It is quite impossible to view all the functions of foodstuffs as being more or less identical, and we cannot logically refer to the replacements of the various food substances in terms of energy, though it is true that there is some relation in the amounts of the various substances which can replace one another in a diet. He proposes to refer to these replacement values in terms of their "sparing" value rather than their isodynamic value and suggests the term isotamicutic instead of isodynamic.

There has been some confusion of ideas in the use of the term protein metabolism, which is frequently used as a synonym for metabolism of protoplasm or the total metabolic activity of the living cell. Protein metabolism, if it ever takes place alone, can never be more than a mere episode in cellular activity, it is insolubly bound up with the metabolism of other products. It has been customary to regard the catabolic phase of cellular activity as the preponderating phase, though some writers maintain that the change of a labile to a stable modification is easier than the change in the opposite direction. This distortion of the actual facts of the case is probably due to the elaborate methods that have been worked out for the detection of the products of catabolism, for there can be no doubt that, when the organism is in a state of equilibrium under normal conditions, anabolic and catabolic activities are approximately equal.

Though the method of disentangling one substance by differentiating its metabolism may lead to only partially true results, it seems the only practical method of dealing with metabolism in detail.

Protein holds a special position as the source of the nitrogen of the organism. All life processes are essentially bound up with protein, and it plays a conspicuous part in the cellular drama.

Protein exists in many different forms; it is frequently specific in its molecular structure, and some of these specificities are almost confined to single organs. It is the disintegration of the specific protein to its constituents which are generally non-specific, which seems to be the characteristic function of digestion; the breakdown of the colloidal whole protein to the dialysable peptides and amino acids.

The problem of metabolism in general and protein metabolism in particular is one of the most complex and obscure in physiology, and as yet our insight into the intricate problems of the nature and changes of living matter is quite inadequate—we see through a glass darkly.

The author has made a valiant attempt to render this intricate problem of physiology clear to the general reader, and, notwithstanding the mass of material available and the strict limitations of space, not without a very considerable measure of success. He has very clearly set out the results of the experimental work of various investigators, but we cannot help wishing that he could have found space for a somewhat more critical examination of the results and the methods by which they were obtained—a task for which few scientific workers are more competent.

The rôle of the accessory food substances in the course of metabolism has been largely omitted, as this subject will be dealt with in a special monograph.

The very complete bibliography of recent literature which is a special feature of these monographs on biochemistry will be of great value to students of this subject.

J. A. G.

A LABORATORY MANUAL OF ORGANIC CHEMISTRY. By H. L. Fisher. New York: J. Wiley & Sons. London: Chapman & Hall, Ltd. Pp. 331. 12s. 6d.

The library shelf devoted to textbooks of practical organic chemistry covering class courses shows signs of becoming overcrowded, and additional volumes can only be of value if written on distinctive lines. Dr. Fisher, in the volume under review, has produced a book to cover the requirements of the American student, and, to some extent, the American atmosphere detracts from its value in this country as a class textbook. The book, however, can be cordially recommended to the attention of lecturers and demonstrators as a source of many useful suggestions.

The cyclostyled instruction sheets in use for a number of years in the laboratories under the author's charge at Columbia University have been repeatedly corrected, points and questions arising from the experiments have been systematically noted, and, finally, the whole has been assembled in book form. The resulting choice of experiments is therefore the fruit of extended observation, and, in our opinion, the experiments are well chosen for their teaching value and for the training in practical manipulation involved.

References occasionally are given to the journal literature, and the description of each experiment is followed by a series of questions designed to draw attention to observations which should have been made while carrying out the experiment or to show the connection between the reaction studied and allied reactions. A number of unusual experiments are included, but one would wish to see useful preparations such as dimethyl-glyoxime added.

The last 93 pages are devoted to an excellent description of the combustion methods of organic analysis.

F. M. P.

Bismuth in High Grade Ores

By G. Spurge

(*Chief Chemist, Dalgety & Co., Sydney*)

IT is some time now since it first occurred to the writer that it might be possible to estimate bismuth in high-grade ores by the colorimetric method, and this method has now been fully tried out and is in daily use in our laboratory in preference to all other methods. The colour method, depending on a yellow colour produced by the addition of potassium iodide to a dilute solution of bismuth, was originally designed for the purpose of estimating traces of bismuth after numerous separations; but experiments proved that separation is unnecessary, and practically nothing appears to interfere with the process.

Procedure.—Weigh up 0·05 gram of agate mortar pulverised for 3 per cent. Bi or over, or 0·5 gram for under, transfer to 500 c.c. graduated flask, add 25 c.c. HNO_3 and 75 c.c. H_2O and boil ten minutes, cool, fill up to mark with H_2O, mix thoroughly and filter about 100 c.c. into dry flask, fill a 10 c.c. or 25 c.c. burette with the solution which is now ready to compare with a standard solution of bismuth. Fill a similar burette to the one used for sample with standard Bi solution and run exactly 1 c.c. into 50 c.c. Nessler Tube together with 10 c.c. of a 10 per cent. solution of KI and 3 drops H_2SO_3; dilute. To a second Nessler Tube add 10 c.c. of the KI solution and 3 drops H_2SO_3 and then run in sample until approximately the same depth of yellow colour is obtained as is contained in standard tube having the sample diluted to the 50 c.c. mark before making the final decision: then read off burette, if this was 5·0 c.cs. and 0·05 gram of ore had been taken the result would be 10 per cent. bismuth.

Standard Bismuth Solution.—Weigh accurately 0·025 gram pure metallic bismuth, transfer to 500 c.c. graduated flask, add 25 c.c. HNO_3 and 75 c.c. H_2O, boil gently 10 minutes, cool, make up to mark with H_2O, mix; 1 c.c. of this solution equals 0·00005 grm. bismuth.

Calculation.—Divide the 500 c.c. by c.cs. consumed of sample, and multiply by value of 1 c.c. of standard, which, in this case, is equal to 0·00005 grm. Bi; this multiplied by 2,000 will give the percentage.

The accuracy of the above method compares favourably with any other method and its simplicity and speed will appeal to everyone where time is a consideration, as it is possible to complete as assay in 15 minutes. Though considerable practice is necessary for high grade material anyone should be able to make accurate estimations up to, say, 20 per cent. and no one once having tried this method will look at any other. Of course in a method of this nature the personal equation enters very largely and good eyesight and extreme care in the manipulations are essential.

At first sight a small quantity like 0·05 gram of sample would appear to be too small, but in actual practice it will be found just as accurate as a larger quantity, but those who prefer it can dissolve 0·5 gram in 250 c.c. and take 25 c.c. of this solution and dilute to 500 c.c. The only need for agate mortar grinding is to enable you to obtain an even sample with so small a quantity not for solubility purposes, as it would dissolve readily enough after passing a 60 sieve.

Copper in large quantities would give a precipitate of copper iodide; this can be filtered off. I have successfully estimated 1·76 per cent. Bi in the presence of 15 per cent. copper direct, the result on the same material after complete separation being 1·73 per cent. The reason the copper does not precipitate and interefere is probably due to the small quantity of ore taken and the large amount of dilution, also the comparison of colour is made promptly before the copper iodide has time to separate out: however, when copper is present in greater quantity than 15 per cent. there are two methods open to the operator: one is to measure off, say, 5 c.c. from sample, transfer to 2 oz. beaker, dilute, add the usual 10 c.c. KI, allow to stand five minutes and then filter direct into Nessler Tube, add sufficient H_2SO_3 to dissolve any free iodine, make up to mark, and then work up a second Nessler Tube up to the same colour with the Standard Bi. The alternative method is to take from 0·5 gram to 2 grams of the ore, according to any knowledge you may have of Bi contents, dissolve in dilute HNO_3 in beaker, further dilute to about 400 c.c., add a solution of NA_2CO_3, with constant stirring until the smallest possible permanent precipitate is obtained, which generally increases on standing; this precipitate will include all the Bi. Allow to stand with occasional stirring for a couple of hours, then filter through quick filtering paper without washing; dissolve precipitate through filter paper with hot dilute HNO_3 direct into 500 c.c. flask, bring total HNO_3 to 25 c.c. dilute up to mark and proceed as before.

Lead in large quantities would probably interfere, but could readily be got rid of with dilute H_2SO_4, but in the examination of hundreds of samples of bismuth ores of all sorts, I have not come across a single instance of it doing so, and the same remarks concerning copper and the large dilution probably apply to lead.

Before finally adopting the colour method in our laboratory every sample was also done for months by the oxychloride method, which when the Bi is completely separated is accurate. The following figures are half-a-dozen consecutive tests from a large number, all of which are similar:—

	Oxychloride.	Colour.
Bi ...	45·36 ...	45·5
,, ...	31·92 ...	31·8
,, ...	43·80 ...	43·5
,, ...	13·10 ...	12·8
,, ...	14·00 ...	13·8
,, ...	16·60 ...	16·3

In conclusion, it is recommended that Nessler Tubes of the clearest glass be obtained, devoid of colour, and with the 50 c.c. mark as near the same height as possible, standing these on a sheet of white paper with the near edge turned up to reflect light from window, up through the tubes will be found better than porcelain or any fancy apparatus. Double the quantity of bismuth in the standard can be used if desired, but any deeper colour is not recommended.

Visit to the French Potash Mines

RECENTLY a party of British and American journalists made a tour of the Alsatian potash mines. A member of the party describes the visit in *The Observer* in the following terms:—

"I have just made a tour of the potash field in Alsace. Much is happening there which is likely to have an important bearing on the general economic evolutions of post-war Europe. It seems clear already that the French, in recovering their lost provinces, have regained an economic prize which their fathers in 1871 never dreamt they were losing. The rich potash deposits lying between Colmar, Thann, and Mulhouse (no longer Mülhausen) are only beginning to be exploited. It was not until 1910 that the German miners brought up the first yield from the Alsatian mines, to add still further to the great wealth which potash brought to Germany. Between then and 1914 the output was necessarily small, the work being pioneer work of a difficult kind. Then came the deluge. Since 1919 the French have thrown themselves down the mines with an élan and a determination of which only a Frenchman is capable. In 1919, on the showing of French statistics, the output was doubled, in 1920 quadrupled, and if present plans are fulfilled, a similar rate of increase will be maintained during the next two years. By that time the French estimate that the production will amount to 34 per cent. of the total pre-war production of potash.

"Potash is one of the three chief fertilising elements, with nitrogen and phosphoric acid, and the efficacy of its scientific use for the purpose of intensive agriculture has been proved. It is probably sound to say as a general principle that those farmers who in any country have used potash extensively have had correspondingly good results. There are soils, peaty, sandy, or chalky, which are almost entirely devoid of potash; others, granitic and the like, contain it in an insoluble state. In almost all soils the use of specially prepared potassic fertilisers has proved beneficial. The Netherlands and Germany have used them most.

"The French acquisition of the Alsatian potash will have far-reaching effects. It has an immediate bearing on the eternal question of reparations, which perhaps has not been given as much attention as it deserves. Under the Treaty of Versailles, in common with other territories formerly belonging to the German Empire, Alsace is to be assessed by the Reparation Commission, and its value to be written off against

Germany's total liability. Up to the present time the mines have been controlled by the French Government, but they will have to be sold sooner or later to private owners. So far, I understand, nothing has been paid into the Reparation Commission out of the proceeds of the mines, because all the available surplus has been swallowed up by capital outlays on extensions, improvements, the building of workmen's cottages and the like. The analogy of the British E.P.D. is hardly sound, because, I understand, the Reparation Commission's assessment of the mines will be precisely the price paid when the mines are sold, and the greater the improvements, the greater presumably the price. Rumour had it last week in the streets of Colmar and Mulhouse that certain of the Alsatians who had a former interest in the mines are intriguing for the restoration of German ownership and control. Be that as it may, and assuming that all goes well in French eyes, it is obvious that the three mines now working in Alsace represent in themselves a considerable contribution to the reparation which France desires.

"When the French took over the mines it was found necessary to retain the services of certain German pivot-men, expert foremen, and the like, but the intention is to replace them gradually as the necessary Frenchmen can be trained."

English China Clays, Ltd.

Total Profit Practically Doubled

THE annual general meeting of English China Clays, Ltd., was held on Wednesday at the Institute of Chartered Accountants, London. The meeting was well attended, and the report and balance sheet presented.

The Chairman (Mr. Reginald Martin) said the position of the Company was very satisfactory, and the shareholders had increasingly valuable properties. In spite of the drawbacks in connexion with the coal strike, the balance sheet would show that they had had a successful year's trading. Considerable preparation and increase had been made during the year, to both plant and works, in anticipation of the revival of trade on the conclusion of the coal strike, and the directors believed that, given freedom from world labour troubles, the future held a promising and bright outlook.

The balance sheet was read and approved by the meeting. Votes of thanks and confidence in the directors were carried unanimously.

The balance sheet indicates that a total profit of £149,800 was secured, as compared with £75,000 in 1919. The allocation to reserve is raised to £10,000. Though both the paid-up preference and ordinary capital is increased as a result of the acquisition of the Melbur China Clay Co., and John Nicholls & Co., the ordinary dividend declared is 7½ per cent., but to avoid depleting too severely cash resources, the distribution of balance, after having paid an interim dividend of 2½ per cent., is made payable in two instalments, the last being on October 1st next. The carry forward is £11,800.

British Industries Fairs

Recommendations of Board of Trade Committee

THE Department of Overseas Trade has just issued the report of the Committee appointed by the Board of Trade to consider the best policy to be adopted in future as regards British Industries Fairs. Shortly, the Committee's recommendations are the following: —

1. That the ideal arrangement would be for the Fair to be concentrated in one centre and that centre London.
2. That the Glasgow Fair be discontinued, but that the Birmingham Fair, having received sufficient support, be continued so long as such support is received.
3. That no new Fairs be initiated in provincial centres.
4. That the Fair should be open to all branches of British industry desiring to participate.
5. That the Fair should continue to be held as hitherto at such centres as will enable buyers from Overseas to visit it *en route* to Leipzig and Lyons, and that no second fair be held in the year.
6. That the Fair should continue in the main to be restricted to bona-fide manufacturers and to wholesale firms taking the whole output of a factory or holding the sole selling rights of patented or proprietary articles manufactured in the British Empire, but that this principle should be relaxed as regards textiles and other groups of products, and that such exhibits should be shown if possible in separate buildings.

The Committee in conclusion emphasises the importance of systematic propanganda.

COUNCILLOR T. RYAN, managing director of the Buxton Lime Firms Company, died suddenly at Yarmouth on May 14

At the Bath and West Society's show at Bristol on June 3, DR. E. J. RUSSELL, of Rothamsted, will lecture on "The Economical Use of Artificial Manures on the Farm."

Under the direction of Dr. C. L. Alsberg, the United States Bureau of Chemistry is engaged in a special study of the SUGAR INDUSTRY OF LOUISIANA, with special reference to the manufacture of high-grade sugars, including absolutely white sugar.

According to the STATISTICAL ABSTRACTS for the 15 years from 1905 to 1919, the total imports into the United Kingdom of chemicals, drugs, dyes and colours were valued at £249,896,431, while the exports totalled £306,687,657. In the three years, 1916-17-18, imports exceeded exports by £21,359,805

The last ordinary scientific meeting of the Chemical Society this session will be held at the Institution of Mechanical Engineers, Storey's Gate, on June 16, at 8 p.m., when PROFESSOR B. MOORE will deliver a lecture on the "Natural Photo-synthetic Process on Land and in Sea and Air,"

Ex-officers in the chemical industry who obtained their commissions from the ranks of the Army, Navy or the Air service are invited to communicate with Captain W. Perkins, 37, Crown Road, St. Margarets, Twickenham, with a view to becoming members of the Ranker Officers' Association.

According to statistics issued by the Board of Trade, British imports from Germany increased £1,750,000 in the final quarter of 1920, as compared with the preceding three months. The largest increase in money value was in the IMPORTATIONS OF DYESTUFFS, which amounted to £3,041,798 in the quarter under review, compared with £1,010,546 in the preceding quarter.

An unofficial Conference of the engineering standardising organisations in various countries was held in London on the invitation of the BRITISH ENGINEERING STANDARDS ASSOCIATION. The Conference deprecated an international organisation, preferring to see international standardisation develop along national lines, and sectionally, as in the case of the International Electro-Technical Commission.

The next meeting of the Society of Public Analysts will be held on June 1 at 8 p.m., in the Chemical Society's Rooms, Burlington House, when the following papers will be read: "The Composition of Egg Powder," by F. F. Beach, T. E. Meade and E. Russell, B.Sc., F.I.C.; "The Colorimetric Method of Determining H ion Concentration: Some Uses in the Analytical Laboratory," by Norman Evers, B.Sc., F.I.C.; and "The Estimation of Woody Fibre in Cattle Food," by F. Robertson Dodd, F.I.C.

The work accomplished by the PATENT OFFICE for the year 1920 was a record. In the 38th report of the Comptroller-General of Patents, Designs and Trade Marks, it is stated that the substantial increase in the work of the office was caused to a considerable extent by the filing of a large number of applications from abroad, under provisions of the treaties of peace. The total number of applications for the year was 36,672, by far the largest number received in any one year, and an increase of 3,819 as compared with 1919. The complete specifications filed numbered 21,796, or 2,874 more than in 1919.

SIR CHARLES H. BEDFORD, late director of the Central Excise Laboratory for India, will read a paper before the Indian and Colonial Sections of the Royal Society of Arts on Friday, May 27, on "Industrial (including Power) Alcohol." The chair will be taken at 4.30 p.m. by Lord Southborough. Sir C. Bedford has just returned from India, where he has been experimentally investigating the commercial and technical possibilities as regards various waste vegetable materials for power alcohol production, as well as various matters relating to the denaturation of and excise restrictions on alcohol

Stocks and Excess Profits Duty

Prejudicing the Traders' Position

IN the course of his speech at the annual meeting of the Maypole Dairy Co., Ltd., Sir W. G. Watson (the Chairman) said that in order to ensure supplies for the factories of their subsidiary companies they had to carry and purchase raw materials in the countries of production equivalent to at least 30,000 tons of crude oil. It took from three to six months after purchase before these raw materials could arrive, and be manufactured and distributed to consumers in the form of margarine.

On the outbreak of war the market price of crude oil was £37 per ton, and the price advanced to £100 per ton by the end of 1919. The advance in the value of the stock of oil they had to carry was reflected in the value of the assets on their balance-sheets and nominally increased their profits. This increase was subject to excess profits duty, but the gain from it was likely to disappear as the price of oil fell to pre-war values.

During last year, he said, the price of crude oil fell from £100 to £70 per ton, and the decrease in value (£30 per ton on 30,000 tons, say £900,000) would have seriously affected last year's results of the trading of their subsidiary companies had not the Excess Profits Act given them the right up to the end of 1920 to reclaim from the Government some of the excess profits duty paid in previous years.

Unless some concession with regard to the value of stocks was made to companies who import raw materials from distant countries, the taking off of the excess profits duty before the fall in prices was completed would seriously prejudice rather than help the traders' position.

Manufacture of Smokeless Fuels

IN an article in the *Manchester Guardian Commercial*, of May 12, Professor H. E. Armstrong refers to the latest plant for the carbonisation of coal which, he states, obviates the softening and swelling of coal when carbonised under pressure. In the plant referred to the Coal is carbonised in a tall, vertical oven, nearly a foot wide, in which are hung two cast-iron plates, arranged so as to allow of small coal being filled into the space between the oven side and the opposed face of each plate, an empty space is left between the two plates. When the charge is carbonised the plates move inwards and away from the heated slabs, the latter then being let down into an air-tight, water-cooled chamber below. The process referred to, states Professor Armstrong, marks a great advance, not only because it affords a smokeless, solid fuel, fit for general use, but also because the volatile matters—gaseous and liquid—expelled on heating coal, which are used uneconomically when raw coal is burnt, may be recovered in producing it.

Chalk as a Substitute for Coal

THE Chalk Fuel, Power-Gas & By-Products Corporation, Ltd., which was formed in 1914 to exploit and work certain inventions and a secret process for the production of cheap fuel, is now making an issue of shares. The prospectus states that the basis of the new fuel is chiefly chalk which exists in inestimable quantities throughout England. The chalk is treated by a secret process and blended with what is described as a rich carbonaceous material, and moulded into briquettes for industrial and domestic use; cinders and household refuse are also utilised. It is further stated that the fuel produces a valuable by-product in that the ash, or waste, remaining after burning may be utilised as a cement or as a fertiliser. The estimated output of fuel for the first year will be 100,000 tons, and the cost of production, including raw material and labour will not exceed 15s. per ton.

Power Alcohol Production

SIR C. H. BEDFORD, late director, Central Excise Laboratory for India, will read a paper before the Indian and Colonial Sections of the Royal Society of Arts on May 27, on "Industrial (including Power) Alcohol." The chair will be taken at 4.30 p.m. by Lord Southborough. Sir C. Bedford has just returned from India, where he has been experimentally investigating the commercial and technical possibilities of various waste vegetable materials for power alcohol production, as well as various matters relating to the denaturation of alcohol.

The Problem of the Fuel Cell

AT a meeting of the Faraday Society on Monday, May 9, a paper by Dr. E. K. Rideal and Mr. U. R. Evans was submitted on the above subject. During the first half of the year 1914, the authors explained, they were engaged on some experiments upon "fuel cells," mainly on the indirect type. The work was interrupted by the outbreak of the war whilst still in the preliminary stages, and there is little chance that they will be able to resume their researches. At the time of the interruption, however, they had—as a result both of their study of the literature of the subject and also of their experimental work—become convinced that there was still a great deal of misconception regarding the essential character of the problem to be solved, and particularly regarding the points which should be recorded in a research in order to arrive at a measure of the success obtained. Some recent publications on the subject of fuel cells led them to think that the misconception was shared, in some instances, by those who were doing practical work on the subject. They considered themselves justified, therefore, in stating their views on this subject, even if their practical work had been entirely fruitless. Many of the attempts led to negative results; but since they were in every case able to assign a definite cause for failure, a summary of these attempts might be of some value in enabling future investigators to avoid failure. Some of the lines of investigation, on the other hand, were developing in a hopeful manner. When the work came to an end it was, however, impossible to draw definite conclusions, as there were clearly many difficulties to be solved. Every experiment described was—at the time when it was performed—regarded as merely a preliminary experiment made with a view to ascertaining whether some particular form of cell was worthy of extended study. After describing the experiments in detail, the authors offered the following conclusions:—

Fuel cells may be classified as (1) direct fuel-cells burning solid fuel. These suffer from current polarisation due to the low velocity with which carbon enters into electrodic reactions.

(2) Semi-direct fuel-cells burning gaseous fuel. These suffer usually from current polarisation due to the difficulty of keeping the electrode material saturated with gas. Mond and Langer overcame this, but in doing so used so much platinum that their cell became far too expensive for practical use. An attempt by ourselves to use nickel instead of platinum as the substratum of a gas-electrode was unsuccessful.

(3) Indirect cells of (*a*) oxidation-reduction type. These suffer from not only *current* polarisation, dependent on the electrode area, but also *time* polarisation, dependent on the cell volume. This second kind of polarisation is economically most important, but has been overlooked by some workers. Some fresh cells of this type were tested by us, but proved unsuitable. (*b*) Metal anode type. Zinc appears unsuited, but preliminary experiment with different cells (both hot and cold) in which tin was the active element gave results which seemed promising.

The results are necessarily incomplete, but it is probable that further research on these lines might lead to favourable results. Every future experimenter, however, should state, as a criterion of success (we are unable to do in our own case owing to the unfinished character of our work)—(1) The fuel consumption, (2) the electrode area, and (3) the cell volume corresponding to 1 watt.

Royal Society's Conversazione

AN interesting collection of apparatus was exhibited at a Conversazione of the Royal Society, held at Burlington House on May 11. British Oil and Fuel Conservation, Ltd., exhibited their Freeman precision temperature control device for the automatic regulation of the supply of the heating medium, and the accurate maintenance of a predetermined temperature. Needham's pulsator system of speed measurement and control was shown by Evershed & Vignoles, Ltd., and a liquid oxygen vaporiser was demonstrated by Mr. E. A. Griffiths. Dr. Kaye and Dr. E. Griffiths were showing the standard optical pyrometer, an instrument designed with a view to facilitating the accurate measurement of high temperatures by the disappearing filament method. Other exhibits included hygrometers of various types, a liquid oxygen vaporiser, a gravity torsion balance, and the recording Kata thermometer.

Position of the Dye Industry

Productive Capacity Exceeds Consumption

AT the annual meeting of the British Cotton & Wool Dyers' Association, Ltd., held in Manchester on May 13, Mr. A. Hoegger, who presided, said the situation regarding the supply of dyestuffs at the present time was quite different from that of a year ago. In the early part of 1920 many colours which were much required were unobtainable, whilst many others could only be supplied in very small quantities and at high prices. Shortly after the Sankey judgment, which was declared in December, 1919, and which permitted free imports of German dyes, the Government made it known that some legislation would soon be brought into force prohibiting the import of dyes except under licence, but a whole year passed before this was done. It was only on January 15 of this year that the Dyestuffs (Import Regulation) Bill came into force; during 1920 large quantities of dyes were freely admitted into this country.

In addition to the dyes imported through the ordinary business channels, the Government had taken over large quantities of reparation colours from Germany. On account of the abnormal depression existing in the textile trades, the consumption of dyes had been small, and stocks of both British and imported dyes had increased very considerably. According to an official report of the Board of Trade the value of coal tar colours imported into the United Kingdom from all sources during the first 10 months of 1920 exceeded £5,000,000 sterling.

Germany was now making dyes at the rate of about 5,000 tons per month, and it had been estimated that the capacity of dye-making in the world was at least double that of the normal consumption.

During the past year British dye makers had introduced many good and useful colours not previously made in this country. The prices at which vat and other fast dyes were put on the market, however, were still too high to allow of an extensive business being done. With a revival of trade it would be necessary to import many of the finer kinds of dyes in considerable quantities, and it was yet too early to predict what effect the Dyestuffs Bill would have upon the textile trades and colour-using industries of this country. Excellent work had been done by British makers, but still much was required to make dye users in this country entirely independent of the Germans.

Great progress was necessary to enable our textile trades to meet the ever-increasing competition in dyed and coloured woven goods and prints containing the brilliant and fast dyes so much admired and in such great demand all over the world.

Chemical and Dyestuffs Traders

Formation of a Manchester Section

AT a meeting of Manchester members of the Chemical and Dyestuff Traders' Association, on Thursday, May 12, in Manchester, Mr. F. T. T. Reynolds in the chair, it was resolved that a Manchester Section be formed and that a local committee be elected consisting of five members including one member of the Executive Council. The following members were elected to form the first committee :—Mr. F. Bayley (F. S. Bayley, Clanahan & Co.), Mr. F. G. Williams, Mr. A. Heywood (T. Pauling & Co., Ltd.), and Mr. C. F. Ashworth. Mr. Heywood was appointed honorary secretary and a chairman will be elected at the first meeting of the committee. It was arranged that meetings be held at the offices of the members as might be found convenient. The following resolutions were unanimously adopted :—

(1) "That the attention of the Government be called to the great and unnecessary delay which is occurring in the release of goods upon which exemption is claimed from the operation of the German Reparation (Recovery) Act, although such goods are urgently wanted and all necessary requirements have been complied with."

(2) "That in view of the acceptance by the German Government of the terms and conditions formulated by the allied Governments for the payment by Germany of the war indemnity the German Reparation (Recovery) Act should be repealed as being superfluous and as tending to continue the uncertainty so detrimental to the revival of trade that is essential in the National interests."

Testing of Scientific Glassware

IN view of the especial need for accuracy in the manufacture of scientific glassware, methods of testing employed by British manufacturers are of interest, as showing the precautions taken to make their products as nearly perfect as possible. In the tests applied by Duroglass, Ltd., the adjustment of a water meniscus to a mark on a vessel is made with the lowest point of the meniscus in the plane which contains the mark, and is observed by shading with a slip of black paper round the vessel, the top edge of which is not more than 1 mm. below the mark on which the setting is to be made, and the meniscus viewed against a white background.

Cylinders and flasks calibrated for delivery are emptied into a glass by gradually inclining them so that when the continuous stream of liquid has ceased they are nearly vertical. In this position they are allowed to drain for half-a-minute and the lip is then stroked against the glass. Ordinary pipettes are clamped vertically for the test, and are filled with water to a short distance above the mark. Water is run out until the meniscus is on the mark and the outflow is then stopped. The drop adhering to the tip is removed by bringing the surface of some water contained in a beaker into contact with the tip and then removing it without jerking. The pipette is then allowed to deliver into a clean weighed vessel held slightly inclined so that the tip of the pipette is in contact with the side of the vessel. The pipette is allowed to drain for a quarter of a minute after outflow has ceased, the tip still being in contact with the side of the vessel.

At the end of the draining time the receiving vessel is removed from contact with the tip of the pipette, thus removing any drop adhering to the outside of the pipette. To determine the instant at which the outflow ceases, the motion of the water surface down the delivery tube of the pipette is observed, and the delivery time is considered to be complete when the meniscus comes to rest slightly above the end of the delivery tube. The quarter of a minute draining-time is counted from this moment.

Burettes and graduated pipettes are also clamped vertically and filled with water to a short distance above the zero mark. Water is then slowly run out until the meniscus is exactly on the zero mark. The drop adhering to the tip is then removed by bringing the tip into contact with the inside of a glass beaker. The instrument is then allowed to deliver freely, *i.e.*, in the case of burettes, with the stopcock fully open, into a clean weighed vessel. It is necessary, however, to arrest the full flow of liquid in time to obtain control over the final movement of the water surface and to bring the meniscus to rest accurately on the line to be tested. The instrument is therefore allowed to deliver freely until the water surface is approximately 1 cm. from the line to be tested. The rate of outflow is then reduced and the motion of the water surface brought under control so that an accurate setting can be made on the line in question. No period of waiting for drainage is allowed. The drop adhering to the tip after the setting has been made is removed by bringing the side of the receiving vessel into contact with the tip.

Safeguarding Key Industries

A PETITION in favour of the Safeguarding of Industries Bill and signed by a hundred members of the staff of Thomas Morson & Son, Ltd., of Ponders End, has been sent to the Prime Minister, the President of the Board of Trade and other M.P.s

The petition states: "We were called upon to supply essential chemicals during the war, and to a still greater extent will our chemicals be required in any future wars.

"We feel that the nation dare not leave this vital 'infant industry' at the mercy of any foreign country. Therefore we urgently request you to give this Bill your hearty support."

At a meeting of the Faraday Society on Monday, May 9, a paper was read by Mr. L. F. Knapp on "The Solubility of Small Particles and the Stability of Colloids." The author explained that the stability of many colloids appeared to be connected with the electric charge carried by the disperse phase. In the paper an attempt was made to explain this relation by consideration of the influence of the electric charge on the solubility of the particles.

Discovery of Borax Deposits

Largest Mineral Purchase in the U.S.A.

WHAT is described as the largest known deposit of borax has been discovered in Clark County, Nevada. Its genuineness is said to have been confirmed by Mr. Hoyt S. Gale, Government geologist, and the deposit has been purchased outright by the West End Chemical Co. of California. The transaction is one of the largest in mineral property in the history of the United States.

The deposit comprises a hill of pure colemanite, the base for borax, some 3,000 ft. in length and 300 ft. to 500 ft. in height, and it is estimated that more than a half-million tons of the ore are in sight. The location is 18½ miles from the main line of the Salt Lake railroad, 46½ miles by automobile from Las Vegas, and about seven miles from the Colorado River. Though easily accessible, it is in a wild region, locally termed the "Muddy Mountain Country," of which hitherto little has been known. Last autumn two prospectors decided to make a thorough exploration of the Muddy Mountain region. After months of fruitless search, in which they worked their way toward the Colorado River, they finally came upon out-croppings of whitish ore resembling crystallised quartz, measuring across the exposed faces 10 to 20 ft., and in at least one place 46½ ft. or more. They continued their observations until they had made an approximate estimate and were convinced they had discovered the largest known deposit of colemanite. The date of discovery was January 23 last.

It is the intention of the West End Chemical Co. to begin shipments of colemanite as soon as possible to its refineries at Searles Lake, California, and in the eastern States. Shipments will be made from Dyke, Nevada, on the Salt Lake railroad until a spur line of railroad is built to the property. The proximity of the deposit to the main line of the railroad and the ease with which it can be mined will enable the company to meet competition in any part of the world. The demand for colemanite is indicated by the fact that a single consumer stands ready to contract for raw material amounting in value to $1,000,000 yearly over a period of 10 years.

Research in Industry

Technological Developments in Wales

IN his presidential address to the Association of Teachers in Technical Institutions, at their annual conference, opened in Cardiff on Monday, Professor G. Knox, of the South Wales and Monmouthshire School of Mines, said they were frequently told that industries had been flooded with half-trained scientists who were absolutely useless and, in some cases, a positive danger; this was, no doubt, partly true, and would to some extent remain true if pure science continued to be taught in water-tight compartments without relation to industry.

Scientific research should not be left to the few who could afford to treat it as a hobby, or become the part-time occupation of a few teachers in their leisure hours. It must be organised on national lines, and every opportunity given to the "one man in a million whose practical value to the community may be worth as much to the community as all the rest of the million put together."

During the past five years a great change had been produced in the attitude of industry to research, with the result that over 20 research associations organised by industry were now in operation, covering all the principal trades in the country. In 1913 a number of large colliery companies in South Wales and Monmouthshire, by means of a tonnage levy on the total output of coal extracted from their collieries, established a school of mines for the development of training in the higher branches of technological science combined with practical works experience. The success of the experiment led to the initiation of a much wider scheme, the object of which was to establish a Board and Faculty of Technology in the University of Wales, which would include the University Colleges of Cardiff and Swansea, the Technical Colleges of Cardiff and Newport, the School of Mines and other institutions. When industry returned to normal conditions this scheme would be put in operation.

A paper was read by Mr. S. R. Illingworth, M.Sc., F.C.S., F.I.C., on "Chemical Research in Technical Institutions and its Relationship to Industry."

French Chemical Industry

AS yet there is no sign of improvement in the French chemical market (the *Journal* of the Society of Chemical Industry states) and several foreign markets, particularly Greece and South America, have been closed to France by German competition. Many German chemical products, particularly pharmaceutical chemicals, are even now finding their way into France, but a higher protective tariff and a general *ad valorem* duty on German imports should remedy this state of affairs. It is felt, however, that the real solution lies in developing the French chemical industry so that it may turn out first-class products at minimum cost. The Cie. Cellulose Francaise d'Alfa, formed to manufacture paper and pulp from Algerian alfa, is contemplating the purchase of the Government's explosives factory at Toulouse, which has been practically dormant since the Armistice. It would take three to four months to adapt the machinery to the company's requirements. The raw material would be shipped from Algeria to Cette, brought by canal to Toulouse, where it would be stored, and then carried by rail to the factory as required. The initial production is estimated at 20 metric tons of pulp from 40 tons of alfa, and the treatment would require 30 tons of coal, 1·5 tons of hydrochloric acid, and 3 tons of caustic soda; plant is available locally for the production of chlorine and caustic soda. It is estimated that paper pulp could be produced to sell at about one-half of the current price.

The proposal to entrust the development of the Alsatian potash mines to a single company has been rejected by the Government Commission which is examining the question, and it has been decided to hand over the mines to four companies, which will have a common sales organisation both for home and foreign markets.

Alleged Profiteering in Soda Crystals

IN the Glasgow Sheriff Summary Court on May 10, before Sheriff Lyell, W. Broadfoot Clark, of 16, Bothwell Street, Glasgow, was charged under the Profiteering Act with having sold 7 tons of soda crystals at a price yielding a profit of 54·77 per cent., which was alleged to be unreasonable, a reasonable profit being 12 per cent.

The Sheriff said before a man could be convicted of making an unreasonable profit, he must know, and get due notice of, the amount of profit he may reasonably charge. He was of the opinion that before the respondent could be convicted it would be necessary to establish that the competent authority had competently published to the respondent that to sell soda crystals at a price so as to obtain a profit exceeding 12 per cent. was a contravention of the statute. It was not for a criminal judge, or for anyone else, to declare that a man had committed a crime by exceeding an unfixed standard.

Continuing, the Sheriff said it was not in accordance with the law of Scotland, and it was certainly contrary to every principle of individual freedom and natural justice.

The case was accordingly continued for trial, on the understanding that it rested with the prosecution to prove that due intimation had been given to the respondent that soda crystals might not be sold so as to yield a profit greater than 12 per cent.

Osmiridium Deposits of Tasmania

THE Department of Mines has just issued a Geological Survey Bulletin, in which mining for osmiridium in Tasmania is exhaustively reviewed. Recent exploration and development have revealed enormous deposits of osmiridium and gold-bearing gravels in the valleys of the larger rivers of the western division. "Tasmania," states the bulletin, "is in the happy position of being the sole producer on a large scale of point metal osmiridium, and there does not appear to be any likelihood of her position being challenged by foreign competitors for many years." It is stated that to-day Tasmania, Russia, Colombia and Papua are the four principal osmiridium producing countries of the world, and Tasmania is by far the most important. In 1910 Tasmania produced 120 oz. of osmiridium valued at £530, or £4·42 per ounce (local). In 1919 the production was 1,669·72 oz., valued at £39,614, or £23·73 per ounce, and for the first half of 1920 the production was 1,093·12 oz., valued at £41,642, or £38·09 per ounce. In March, 1920, the local price reached £42 10s. per ounce.

From Week to Week

Considerable quantities of SULPHURIC ACID are produced by the Rio Tinto Co. of Huelva, Spain.

The Paisley Town Council propose borrowing £100,000 for the erection of VERTICAL RETORTS at the gas works.

CONSIDERABLE DAMAGE was caused by a fire on May 14 at the oil works of Robert Taylor & Co., Stratford-by-Bow.

W. J. BUSH & CO. have removed their New York offices from 100, William Street to 370, Seventh Avenue.

LORD LEVERHULME'S residence at Hampstead has been entered by burglars, who removed a dressing case containing jewellery.

The erection of works at Aussee for the manufacture of CAUSTIC SODA is contemplated by a group of Austrian manufacturers.

It is reported that a NEW SOAP FACTORY has been erected at Rielce (Poland). The probable daily output of soap is estimated at 12,000 lb.

No fewer than 144 new chemical works were established in Japan in 1920. These concerns had between them a capital of 160,357,000 yen.

It is reported that the United Glass Bottle Manufacturers, Ltd., intend to convert the furnaces of their Charlton works to burn OIL IN PLACE OF COAL.

LONDON OFFICES have been opened at Sardinia House, Kingsway, W.C. 2, by Blair, Campbell & McLean, Ltd., chemical plant manufacturers, of Govan.

Donations totalling £3,078 10s. in connexion with their RESEARCH SCHEME were received up to March 31 by the Council of the Society of Dyers & Colourists.

MESSRS. RICHARDSON & FLETCHER, fertiliser manufacturers, of Ringsend Road, Dublin, announce that they have no connexion with any other firm in any other part of Ireland.

A NEW DYE known as Atlantic yellow R, and described as a clear reddish sulphur yellow of standard properties, has been put on the market by the Atlantic Dyestuffs Co., of America.

The new Customs Tariff now in force in TRINIDAD AND TOBAGO provides for a British preferential tariff of 10 per cent. *ad valorem*. The general tariff rate is 20 per cent. *ad valorem*.

Plant for the production of SPIRIT FROM COAL AND LIMESTONE is being erected at Nienburg by a recently formed company known as the Anhaltisch-Salchsische Spiritus-und-Aetherfabrik.

Intimating that, although the trade is utterly stagnant, they desire loyally to discharge their obligations, the SALT UNION, LTD., have given their workpeople their annual holiday with pay this week.

During March the United States exported ANILINE DYES valued at $282,837 to British India. Japan came next with $188,615, while the United Kingdom was among the lowest, with $1,818.

Although there were in existence in December, 1919, eight licences to explore the MINERAL OIL over areas in the North-Western and Pomeroon districts of British Guiana, no definite results were recorded.

Mr. K. E. BEHRENS, manager of the New York office of the Albany Chemical Co., sailed for Europe on April 28. He intends to visit the principal European centres in the interests of several American chemical houses.

Steps are being taken by the Distillers' Co., Ltd., to produce ALCOHOL AS A MOTOR FUEL on a large scale. The new fuel consists of a mixture of 50 per cent. of alcohol, 25 per cent. of benzol, and 25 per cent. of paraffin.

The officers of the CHEMICAL SECTION of the Manchester Literary and Philosophical Society for the 1921-22 session have been elected as follows: Chairman: Mr. Leonard E. Vlies; Vice-Chairman: Mr. J. H. Lester; Hon. Secretary: Mr. D. Cardwell.

Sir Kenneth Goadby will lecture before the Royal Society of Arts on May 30 on the possibility of establishing tests for the elimination from occupations involving RISK OF POISONING of those workers who are specially susceptible, some persons being peculiarly liable to poisoning, while others are almost immune. Mr. J. R. Clynes, M.P., will preside.

At the Waldorf Astoria Hotel, New York, on Tuesday, a luncheon was given in honour of MME. CURIE by the American Chemical Society, the New York Academy of Sciences, the American Electro-chemical Society, the Society of Chemical Industry, the Société de Chimie Industrielle, the New York Electrical Society and the Cooper Union Chemical Society.

At a recently-held meeting of the Gas Committee of Glasgow Corporation it was reported that a sub-committee had inspected the sulphate of ammonia plant at the Bedlay Works of Williams, Baird & Co., Ltd., and that the manager had inspected the plant at the Phœnix Works of the South Metropolitan Gas Co., London. The sub-committee, after consideration of a report by the manager on the different types of plant used by these firms in the production of a neutral dry sulphate of ammonia, requested him to prepare and submit plans of his own designing suitable for the final treatment of sulphate of ammonia.

At a meeting of the Royal Society to be held on May 26 papers are expected to be read by Sir Alfred Ewing on "The Atomic Process in Ferro-magnetic Induction"; C. D. Ellis, on "The Magnetic Spectrum of the β-rays Excited by the γ-rays" (communicated by Sir Ernest Rutherford); S. Datta, "On the Spectra of the Alkaline Earth Fluorides and their Relation to each other" (communicated by Prof. A. Fowler); Dr. W. L. Balls, on "A Simple Apparatus for Approximate Harmonic Analysis and for Periodicity Measurements (communicated by Dr. F. F. Blackman); Dr. G. R. Goldsbrough, on "The Influence of Satellites upon the Form of Saturn's Ring (communicated by Prof. T. H. Havelock); Dr. H. Jeffreys, on "Certain Geological Effects of the Cooling of the Earth" (communicated by Dr. G. C. Simpson); and T. Kikuchi, "The Moving Striations in a Neon Tube" (communicated by Sir Ernest Rutherford).

Chemical Matters in Parliament

German Reparation (Recovery) Act

Mr. Chamberlain (House of Commons) May 13), in reply to Captain Wedgwood Benn, said the Government thought it inexpedient to repeal or suspend the German Reparation (Recovery) Act until they had further experience of the working of the terms to which Germany had just given her adherence, but the rate of duty would be reduced to 26 per cent., and its collection here would be in substitution for and not in addition to the general levy on all exports collected in Germany.

Merchandise Marks Bill

In reply to Mr. Wise (House of Commons, May 12), Sir P. Lloyd-Greame said he could not say when the Merchandise Trade Marks Bill would be introduced.

Basic Slag

Mr. W. Thorne (House of Commons, May 12) asked the Minister of Agriculture if he was aware that there were thousands of tons of basic slag produced in this country; that it was a special feature of the steel trade to-day; that it was sold to farmers for agricultural purposes; that the average price of English basic slag, ground for putting on the land, containing about 18 to 20 per cent. phosphate of lime was probably about £5 per ton; what was the average selling price of ground basic slag imported into this country; and whether the Ministry of Agriculture were doing anything to encourage the farmers to use English basic slag instead of imported ground slag?

Sir A. Boscawen said the answers to the first three parts of the question were in the affirmative. The selling price of basic slag, containing 18 to 20 per cent. phosphate of lime, delivered free to purchaser's station or wharf in Great Britain was limited until May 31, 1921, to £5 6s. 6d. per ton under an agreement entered into between the Department and the trade. He had no information as to the selling price in the United Kingdom of imported ground basic slag, as there were no restrictions on the sale of slag at less than the above price, but he was informed that during the three months ended March 31 last, the amount of imported slag for agricultural purposes was probably under 10 per cent. of the amount delivered by British manufacturers to consumers in the United Kingdom for the same purposes. He thought that farmers had been made fully aware of the value of English basic slag.

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Patent Literature

Abstracts of Complete Specifications

161,591. SECONDARY BUTYL ALCOHOL, MANUFACTURE OF. C. Weizmann, 41, Campden House Road, Kensington, London, W., and D. A. Legg, 15, Sisters Avenue, North Side, Clapham Common, London, S.W. Application date, February 24, 1916.

The process is for the manufacture of secondary butyl alcohol ($CH_3CHOH.CH_2CH_3$) from dimethylethylene—*i.e.*, symmetrical or β-butylene ($CH_3CH=CH.CH_3$). Sulphuric acid of 75 per cent. strength is cooled to −10°C. to −15°C., and butylene is passed through it and liquefies on the top. The vessel is then closed, and the liquids mixed until the butylene dissolves in the acid. Alternatively, phosphoric acid or benzene sulphonic acid may be used and in the latter case iron vessels may be employed without corrosion. The mixture is finally distilled with steam, and yields chemically pure, secondary butyl alcohol.

161,606. ALUMINOUS COMPOUNDS, MANUFACTURE OF. P. Spence & Sons, Ltd., H. Spence and W. B. Llewellyn, Manchester Alum Works, Holland Street, Manchester. Application date, October 11, 1919.

The object is to purify solutions of aluminium sulphate from iron compounds. A clear solution of aluminium sulphate containing a potassium salt and an excess of about 5 per cent. to about 10 per cent. of alumina beyond that required to form neutral sulphate, is agitated with finely divided insoluble matter in suspension. A suitable insoluble matter is the silicious residue obtained in the treatment of aluminous material with sulphuric acid. This material is ground in the wet condition to a state of very fine division and the resulting mud is added to the aluminium solution in the proportion of 10 parts of the dry insoluble matter to 14 parts of alumina. A basic ferric potassium sulphate containing a proportion of alumina is precipitated and separated. This precipitate may be ground and may be used as the suspended material for the next operation. Alternatively, very finely divided native alunite may be used as the suspended material.

161,608. RETORTS FOR THE DISTILLATION OF CARBONACEOUS SUBSTANCES. Low Temperature Carbonisation, Ltd., T. M. Davidson, and H. L. Armstrong, 14-16, Cockspur Street, London, S.W. 1. Application date, October 14, 1919.

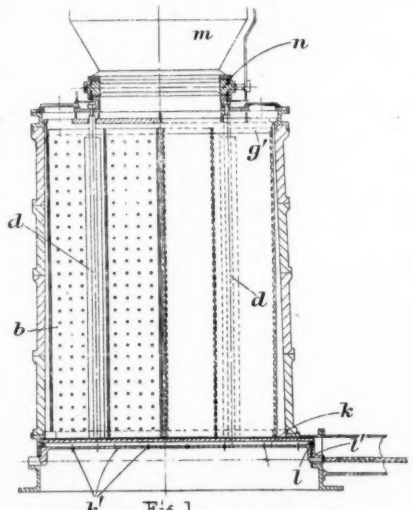

Fig. 1

Fig. 2

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The apparatus is for distilling coal and other carbonaceous substances under low temperature conditions up to 750°C., and means are provided to facilitate the discharge of the residue from vertical retorts and the withdrawal of the distillate out of contact with the hot wall of the retort. The vertical retort is constructed with parallel vertical side walls, and with end walls tapering slightly outwards towards the bottom. A central chamber *a* is provided in the retort, composed of two parallel perforated plates *b,b*, so that an annular chamber *c* is also formed. The plates *b*, *b* are covered by a bridge piece *g'*, and are loosely suspended from it by transverse bolts. Two or more vertical rods, *d,d*, are provided between the plates *b*, *b*, and are of oval section, so that when they are rotated the distance between the plates *b*, *b* may be varied. The plates slide on their supporting bolts during their inward and outward movement. Coal is supplied from the hopper *m* through a rotary door *n* to the space *c*, the plates *b,b* being previously opened to their fullest extent. Water is admitted to the channel *k* in the bottom door *l*, which is mounted on a hollow trunnion *l'*, and the steam generated passes out through the openings *k'*, and then upwards around the sides of the door into the fuel. The distillate passes out through openings in the bridge piece. After the distillation process has started the rods *d* are partly turned so that the plates *b*, *b* are allowed to move inwards and allow for the expansion of the fuel. When the distillation is complete the rods *d*, *d* are turned 90° from their original position, and the door *l* is opened, so that the residue may be discharged without adhering to the retort walls.

161,654. IRON AND TIN FROM TIN SCRAP, METHOD OF OBTAINING. P. A. Mackay, 70, Lombard Street, London. Application date, January 9, 1920.

Tin scrap is dried and cleaned and dipped into sulphuric acid containing free sulphur trioxide. The tin is dissolved in about ten minutes, and the material is then lifted from the acid, and immersed in water. A considerable proportion of the oxidised tin is carried into the water, where about half of it is precipitated as oxide. The remainder is recovered either by precipitation as tin sulphide, or by adding iron to the solution, when metallic tin is precipitated. When the sulphuric acid becomes concentrated with tin, a portion separates out in suspension as SnO_2SnSO_4, and is removed. The iron scrap remaining is dried, and does not readily oxidise.

161,655. STRONTIUM AND BARIUM SULPHATES FROM THEIR NATIVE SULPHATES, METHOD OF OBTAINING. P. A. Mackay, 70, Lombard Street, London. Application date, January 9, 1920.

The object is to obtain strontium and barium sulphates in a very finely divided form, of an opaque consistency, and white in colour. The natural sulphate is finely ground, and then dissolved in sulphuric acid containing free sulphur trioxide in solution. The sulphate is preferably ground until it passes a screen having 200 meshes per linear inch, and then added gradually to the acid with continual stirring. The solution is then poured into a large volume of water, when the sulphates are precipitated in a very finely divided condition, and are then removed and dried.

161,656. COPPER SULPHATE DIRECT FROM METALLIC COPPER, PROCESS OF OBTAINING. P. A. Mackay, 70, Lombard Street, London. Application date, January 9, 1920.

Refined or blister copper is dissolved in sulphuric acid in the presence of a catalyst consisting of a more electro-negative metal than copper. When treating refined copper free from electro-negative metals, the metal is granulated, heated above 100°C., and added to sulphuric acid of about 70 per cent. strength heated to about 100°C. An electro-negative metal such as silver or mercury is then added, and dissolved by adding a trace of nitric acid to form the catalytic agent. The copper then dissolves forming a sulphate. If an excess of copper is used, the silver is deposited on it, and is recovered. When blister copper is treated, electro-negative metals such as silver and gold are present, and are dissolved by adding a trace of nitric acid. If oleum is used instead of nitric acid, a small

proportion of water is added, and the heat generated obviates the use of any external heating. The process may be used for refining blister copper, when the gold and silver are recovered by precipitation by use of an excess of blister copper.

161,679. OXYALDEHYDES AND THEIR DERIVATIVES, PROCESS FOR MANUFACTURE OF. G. B. Ellis, London. (From Soc. Chemique des Usines du Rhone, anciennement Gilliard, P. Monnet et Cartier, 89, Rue de Miromesnil, Paris.) Application date, January 13, 1920.

A phenol or phenol derivative is treated with a formaldehyde in the presence of a nitroso compound such as nitroso benzene, nitroso naphthalene or para nitroso dimethylaniline, and also a condensing agent and a solvent. The process is applicable to the manufacture of the oxyaldehydes corresponding to phenol, anisol, salicylic acid, pyrocatechin, &c. In an example, 4 parts of guaiacol, the nitroso dimethylaniline derived from the reaction of nitrous acid on 8 parts of dimethylaniline and 8 parts of a 40 per cent. aqueous solution of formaldehyde are added to 50 parts of methyl alcohol. The mixture is heated, hydrochloric acid gas is passed through, the product is cooled, diluted with water, and the methyl alcohol separated by rectifying. The aqueous solution is agitated with benzene or ether to separate the vanillin. Reference is directed in pursuance of Section 8, Sub-section 2 of the Patents and Designs Acts, 1907 and 1919, to Specification No. 139,153.

161,859. NAPHTHYLAMINE SULPHONIC ACIDS, MANUFACTURE OF. South Metropolitan Gas. Co., and H. Stanier, 709, Old Kent Road, London, S.E. Application date, May 25, 1920.

In manufacturing 1 : 4 : 8- and 1 : 3 : 8- naphthylamine disulphonic acids, the mixture of these acids usually contains other naphthylamine disulphonic acids, particularly the 2 : 4 : 7- and 2 : 4 : 8- acids, and the process is for separating a mixture of these acids, by means of the difference in solubility between the barium salts. The normal barium salt of the 1 : 4 : 8- acid is nearly insoluble in boiling water but the normal salts of the other salts are soluble. The acid barium salt of the 1 : 3 : 8- acid is slightly soluble in hot water, but the acid salts of the 2 : 4 : 7- and 2 : 4 : 8- acids are readily soluble in hot water. The mixture of disodium salts of the four isomeric acids is boiled with the calculated quantity of soluble barium salt and the normal barium salt of the 1 : 4 : 8- acid is precipitated and filtered off. The solution is acidified while still hot and the acid barium salt of the 1 : 3 : 8- acid is precipitated and filtered off. The barium salts may be converted into other salts by boiling with the corresponding carbonate.

NOTE.—The following specifications which are now accepted were abstracted in THE CHEMICAL AGE when they became open to inspection under the International Convention: 133,712-3 (M. Melamid), relating to resinous substances, *see* Vol. I., p. 728; 140,387 (G. Bruni), relating to vulcanising rubber, *see* Vol. II., p. 563; 142,480 (A. Classen), relating to obtaining sugar and furfurol from wood, *see* Vol. III., p. 78; 143,243 (K. G. Wennerstrom), relating to cement, *see* Vol. III., p. 137; 144,240 (B. Junquera), relating to concentrating solutions, *see* Vol. III., p. 188; 146,332 (F. Bergius and P. Kalnin), relating to separation of gases, *see* Vol. III., p. 353; 146,865 Elektro-Osmose Akt.-Ges., Graf Schwerin Ges.), relating to purifying glycerine, *see* Vol. III., p. 381; 147,583 (C. Still), relating to purifying ammonia, *see* Vol. III., p. 430.

International Specifications not yet Accepted

160,143. MOLYBDENUM, EXTRACTING. Ampère-Ges., 13, Bellevuestrasse, Berlin, F. Rothe, Wannsee, and O. Diefenthaler, Rhine-Baden, Germany. International Convention date, March 12, 1920.

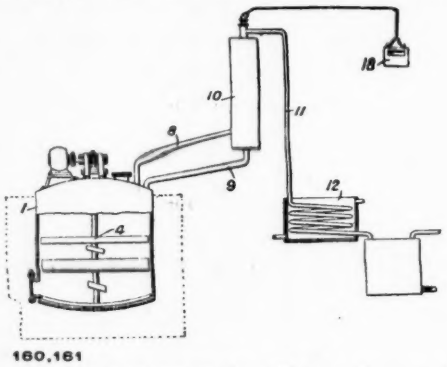
Roasted molybdenite is mixed with powdered limestone and water, briquetted and dried, and then reduced in an electric furnace by means of coal.

160,148. SYNTHETIC RESINS. Barrett Co., 17, Battery Place, New York. (Assignees of S. P. Miller, 6503, York Road, Philadelphia, Pa., U.S.A.) International Convention date, March 8, 1920.

Naphtha containing coumarone, indene, &c., is purified by treating with dilute sulphuric acid and then polymerized by treating with sulphuric acid or aluminium chloride at a temperature below 20°C. The product is neutralised, washed, distilled and steam distilled, yielding a light-coloured resin of high melting point.

160,161. CRACKING HYDROCARBONS. Kansas City Gasoline Co., First Street, Kansas, U.S.A. (Assignees of H. M. Lasher, First Street, Kansas, U.S.A.) International Convention date, March 12, 1920.

A mixture of fuel oil and powdered bituminous coal is heated in a still 4 having a continuously rotating stirrer. The distillate passes to a fractionating apparatus 10, and the



160,161

heavier constituents return to the still by a pipe 9, while the vapour passes by a pipe 11 to a condensing coil 12. The oil is distilled at atmospheric pressure and at a temperature of 600°–1,000°F., the oil being replenished as it is distilled off. The charge may be distilled to dryness, leaving a coke residue.

160,172. SODIUM BICARBONATE AND AMMONIUM CHLORIDE. L'Air Liquide, Soc. Anon. pour l'Etude et l'Exploitation des Procédés G. Claude, 48, Rue St. Lazare, Paris. International Convention date, March 17, 1920.

Mother liquor containing ammonium carbonate and ammonium chloride is treated first with salt and gaseous ammonia and then with pure carbon dioxide under pressure, with continuous stirring and cooling. Sodium bicarbonate is precipitated, and is then removed and washed. The mother liquor is treated with ammonia to convert the bicarbonate into carbonate, and is then cooled to 5°–10°C. to crystallise ammonium chloride. The liquor is diluted and used over again. In an alternative process, the saline solution of ammonium carbonate may be treated with a solution of ammonium bicarbonate prepared from wash water with ammonia and carbon dioxide.

160,426-7. EXTRACTION OF METALS. A. Pacz, 2277, Chatfield Drive, Cleveland Heights, Ohio, U.S.A. International Convention date, March 18, 1920.

160,426. A double fluoride of sodium and another element, such as zirconium, is reduced by means of aluminium in the presence of a molten metal with which the zirconium alloys—*e.g.*, aluminium. The aluminium may then be dissolved out to obtain the zirconium. In another example a mixture of sodium silico fluoride obtained as a by-product from superphosphate manufacture and aluminium powder is added to molten aluminium, yielding an alloy of silicon and aluminium. Alloys of aluminium with boron, iron, copper, zinc, chromium, cobalt, nickel, &c., may be obtained in a similar manner. If a bath of molten iron is used instead of aluminium, alloys of these metals with iron may be obtained.

160,427. Alloys obtained as in 160,426, or the metals obtained by removing aluminium, may be used as a constituent in a thermo-reduction mixture for obtaining high temperatures or reducing refractory oxides.

160,428. CATALYSTS, RECOVERING. Soc. Anon. l'Oxhydrique Française, 25, Rue Beranger, Malakoff, Seine, France. International Convention, date, March 20, 1920.

Treated oils or fats are filtered through asbestos porcelain or biscuit porcelain at a temperature of 200°C. and pressure of 1 to 3 kilos per square centimetre to recover the catalyst.

160,433. ANTHRAQUINONE DERIVATIVES. Farbwerke vorm. Meister Lucius & Bruning, Hoechst-on-Main, Germany. International Convention date, March 11, 1920. Addition to 147,001. (*See* THE CHEMICAL AGE, Vol. III., p. 382.)

Products of greater purity are obtained by the process described in 147,001 in the absence of air—*e.g.*, 1-nitro-2-methyl-anthraquinone is treated with fuming sulphuric acid in an atmosphere of carbon dioxide.

160,454. AMMONIA. G. P. Guignard, Avenue des Marronniers, Melun, Seine et Marne, France. International Convention date, March 19, 1920.

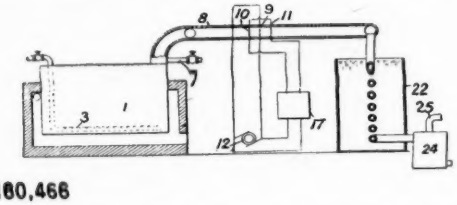
Titanium nitride or titanium cyanogen compounds are treated with steam with or without oxygen. The temperature is kept below 500°C., and the ammonia and other gases withdrawn and passed through milk of lime or an alkali. Ammonia and a cyanide are produced. If the solution is hot, a formate is obtained instead of cyanide.

160,455. ZINC, OBTAINING FROM ORES, &C. Rheinisch-Nassauische Bergwerks & Hutten-Akt.-Ges., and A. Spieker, Stolberg, Germany. International Convention date, March 17, 1920.

Retort residues, slags or poor ores containing zinc are mixed and briquetted with basic or acid fluxes in such a proportion that when passed through a shaft furnace no reaction takes place until the hottest zone is reached, when zinc and lead are vaporised, and iron, nickel, cobalt, copper, silver, &c., remain in the residue.

160,466. CRACKING HYDROCARBONS, &C. Chemical Fuel Co. of America, Third Street, Louisville, Ken., U.S.A. (Assignees of E. W. Stevens, 2726, St. Paul Street, Baltimore, Md., U.S.A.) International Convention date, March 18, 1920.

Gas oil is heated in a still 1 having a pipe 3 for injecting hydrogen or natural gas, and the vapour then passes through a tube 8 having a wire-cloth diaphragm 9 of nickel, iron or cobalt. This is heated electrically by current from a generator 12 and diaphragms 10, 11 of nickel or aluminium are connected to an oscillator 17, which also receives current from



160,466

the generator 12. High-tension electric spark discharges thus pass through the catalyst, and the deposit of carbon on it is avoided. The cracked and hydrogenated vapour passes through a condenser 22, and the condensate collects in a tank 24. The residual gas may be drawn off for heating purposes. Hydrogen may be produced in this apparatus by passing a mixture of water gas and steam through the catalyst and electric discharge screens.

160,467. WOOD, &C., DISTILLING. Rutgerswerke-Akt.-Ges., 33, Lutzowstrasse, Berlin, and H. Teichmann, Rauxel, Westphalia, Germany. International Convention date, March 17, 1920.

A mixture of substances such as wood, peat, brown coal, cellulose, paper, wool, horn or the like and tar oil is heated in a closed vessel to 100°–300°C., when about 90 per cent. is dissolved. The resulting solution is distilled, and acetic acid, methyl alcohol, acetone and creosote are obtained. A residue of finely divided carbon is obtained. If the distillation temperature is lower, a pitch residue is obtained which may be used for impregnating wood.

LATEST NOTIFICATIONS.

163,016. Production of cellulose ethers. Lilienfield, L. May 5, 1921.

163,017. Production of ethers of carbohydrates having the empirical formula $_nC_6H_{10}O_5$, their conversion products and derivatives. Lilienfield, L. May 5, 1920.

163,018. Manufacture of ethers of carbohydrates having the empirical formula $_nC_6H_{10}O_5$, such as cellulose, starch, dextrine and the like. Lilienfield, L. May 5, 1920.

163,026. Process and apparatus for the production of concentrated nitrous gases. Norsk-Hydro-Elektrisk Kvaelstoffaktieselskab. May 5, 1920.

163,030. Manufacture of sulphuric acid. Murat, G., and Pipereaut, P. May 6, 1920.

163,042. Manufacture of artificial fuel. Fournier, F. F. May 10, 1920.

163,011. Method of and apparatus for separating water from coal tar. Bismarckhütte. May 6, 1920.

163,015. Apparatus for the measurement of gases, vapours, and liquids. Liese, H. [Firm of]. May 6, 1920.

163,046. Catalyst and method of preparing the same. Nitrogen Corporation. May 8, 1920.

163,047. Preparation of gas mixture and ammonia. Nitrogen Corporation. May 8, 1920.

Specifications Accepted, with Date of Application

134,223. Products soluble in or forming emulsions with water, Manufacture of. M. Melamid and L. Grotzinger. October 31, 1917.

138,115. Oils and fats, Refining. V. Schwarzkopf. October 25, 1918.

138,124-6-8. and 138,333-4-5. Coke ovens. American Coke & Chemical Co. January 3, 1916, November 9, 1917, September 15, 1916, January 27, 1919, January 27, 1919, and January 27, 1919.

138,129. Ammonia saturators. American Coke & Chemical Co. April 17, 1915.

140,083. Protection for the walls of enclosures in which reactions take place under high temperatures and pressures. Soc. l'Air Liquide Soc. Anon. pour l'Etude et l'Exploitation des Procédés G. Claude. December 18, 1918.

145,036-7. Fertilisers, Manufacture of. Badische Anilin and Soda Fabrik. July 29, 1916, and March 26, 1917. 145,037, addition to 145,036.

145,477. Electrical gas purification, Process for. Metallbank und Metallurgische Ges. Akt.-Ges., and J. E. Lilienfeld. August 8, 1918.

147,020. Ores, Removal of dust from the gases derived from the roasting of. Manufactures de produits Chimiques du Nord Etablissements Kuhlmann. May 6, 1914.

148,763. Salts of sulpho acids from lignite tar oils, Process for obtaining. Sudfelt & Co. May 14, 1919.

162,303. Aluminium hydroxide, Process for the production of. M. Buchner. November 28, 1917.

162,314. Ammonia from gases, Extraction of. E. L. Pease October 29, 1919.

162,337. Oil from substances such as bitumen and shale, Recovery of *in situ*. D. Diver. December 23, 1919.

162,370. Continuous hydrogenation of unsaturated oils, fats and the like, Process for. E. R. Bolton. January 26, 1920.

162,382. Maintaining activity of metallic catalysts during hydrogenation of oils, fats and the like. E. R. Bolton and E. J. Lush. January 27, 1920.

162,390. Separating suspended matter from liquids. A. F. Meston. January 28, 1920.

162,429. Caoutchouc, Vulcanisation of. S. J. Peachey. February 12, 1920. Addition to 129,826.

162,459. Solid and gaseous fuel and by-product recovery plant. H. Nielsen and J. R. Garrow. February 23, 1920.

162,554. Sulphur from gases, Removal of. N. E. Rambush. May 21, 1920.

162,578. Trinitroresorcine, Manufacture of. W. Friederich. July 2, 1920.

Applications for Patents

Ashcroft, E. A., & Lacell, H. G. Production and purification of lead. 13,007. May 13.

Booer, J. R. Materials for purifying acetylene gas. 13,180. May 9.

Dale, A. G. Apparatus for analysis and recording of gases. 13,447. May 12.

District Chemical Co., Ltd. Materials for purifying acetylene gas. 13,180. May 9.

Dunstan, A. E. Treatment of petroleum, &c. 13,174. May 9.
,, Refining liquid hydrocarbons. 13,515. May 12.

Empis, H. C. Apparatus for vaporising hydrocarbons. 13,271. May 10. (France, June 29, 1920.)

Farbenfabriken vorm. F. Bayer & Co. Manufacture of new copper compounds of substantive azo-dye-stuffs. 13,624. May 13. (Germany, June 14, 1920.)

Fournier, F. F. Manufacture of artificial fuel. 13,246. May 10. (France, July 30, 1920.)

Gaillard, E. A. Manufacture of sulphuric acid. 13,210. May 10.

Hoffman-La Roche & Co. Akt.-Ges., F. Process for manufacture of easily and neutrally soluble double compounds of 1-allyl-3·7-dimethylxanthine. 13,674. May 13. (Switzerland, July 2, 1920.)
,, Process for manufacture of 1-allyl-3·7-dimethylxanthine. 13,675. May 13. (Switzerland, June 22, 1920.)

Market Report and Current Prices

Our Market Report and Current Prices are exclusive to THE CHEMICAL AGE, *and, being independently prepared with absolute impartiality by Messrs. R. W. Greeff & Co., Ltd., and Messrs. Chas. Page & Co., Ltd., may be accepted as authoritative. The prices given apply to fair quantities delivered ex wharf or works, except where otherwise stated. The weekly report contains only commodities whose values are at the time of particular interest or of a fluctuating nature. A more complete report and list are published once a month. The current prices are given mainly as a guide to works managers, chemists, and chemical engineers; those interested in close variations in prices should study the market report.*

Market Report

THURSDAY, May 19.

There have been very few developments in the chemical market during the current week owing mainly to the holidays and the continuance of the coal stoppage. The undertone, however, is quite firm, and it is thought that stocks of a number of products are becoming light.

Export enquiry has been slightly better, without, however, resulting in a much larger volume of business.

General Chemicals

ACETONE.—The price has advanced and stocks are now very light.

ACID ACETIC is very firm but business is light.

ACID CITRIC is in enquiry and is slightly firmer.

ACID FORMIC is stagnant, but without change in value.

ACID LACTIC has been in request, and the price is firmer, mainly owing to the absence of Continental competition.

ACID OXALIC is steady with little business passing.

ACID TARTARIC is only in quiet demand, but the price is well maintained.

BARIUM CHLORIDE is in slightly better request without change in value.

BLEACHING POWDER is idle, and the price continues in buyers' favour.

COPPER SULPHATE is in better request, and the price is maintained.

FORMALDEHYDE is without change in value, and only a small business is passing.

LEAD ACETATE is slightly more active, and the price is without change.

LEAD NITRATE is in better request and the price is inclined to be firmer.

MAGNESIUM SULPHATE is in slightly better demand, and the price is firm at last quoted figures.

POTASSIUM BICHROMATE.—The demand is very small and there are re-sellers in the market at under makers' figures.

POTASSIUM CARBONATE is a purely nominal market, and there appear to be fairly heavy stocks.

POTASH CAUSTIC remains uninteresting.

POTASSIUM PERMANGANATE is only in small request, but the price is well maintained.

POTASSIUM PRUSSIATE has sharply advanced, and stocks are extremely light.

SODIUM ACETATE is practically without change, with little business passing.

SODIUM BICHROMATE is still in buyers' favour.

SODIUM CAUSTIC is without feature, and re-sellers are quoting at lower than makers' figures.

SODIUM HYPOSULPHITE is in fair request, and the price is without change.

SODIUM NITRITE is in small request and price is maintained.

SODIUM PHOSPHATE.—There is a shade more life in this article, and the price still favours buyers.

SODIUM PRUSSIATE has further advanced in price.

SODIUM SULPHIDE is idle, and is inclined to favour buyers.

ZINC SULPHATE has been in somewhat better request.

Coal Tar Intermediates

There is practically no change in the position, and most manufacturers are closed down this week. In the main, deliveries are being made from stocks.

ALPHA NAPHTHYLAMINE is fairly active, without change in price.

ANILINE OIL and SALT are both quiet.

BETA NAPHTHOL is idle, but makers hold to their price.

BENZIDINE BASE has been in somewhat better request and stocks are firmly held.

DIMETHYLANILINE is in small enquiry.

DIPHENYLAMINE is very quiet.

H. ACID is enquired for, but appears to be in very light supply.

NITROBENZOL continues a steady market.

NAPHTHIONIC ACID is idle.

PARANITRANILINE is only occasionally asked for, and the price favours buyers.

RESORCIN.—This product is moving in small quantities without change in value.

SALICYCLIC ACID is firm and inclined to advance.

Coal Tar Products

As time goes on, stocks of various coal tar products are being still further reduced, and prices are consequently stiffening slightly, although the demand remains poor.

BENZOL 90's is scarce and selling at 2s. 10d. on rails in the North and 3s. in the South.

PURE BENZOL is nominally worth 3s. in the North and 3s. 2d. in the South, although there are few buyers.

CREOSOTE OIL is somewhat scarce and is worth about 8d. per gallon in the North and 9d. to 9½d. in the South.

CRESYLIC ACID is very dull, and is worth about 2s. to 2s. 1d. per gallon on rails for 97/99 per cent. quality and about 1s. 11d. for 95/97 per cent. quality.

SOLVENT NAPHTHA is somewhat scarce, and is quoted at 2s. on rails.

HEAVY NAPHTHA is worth about 2s. 3d. on rails.

NAPHTHALENE is in poor demand, the price for crude being from £8 to £12 and for Refined from £18 to £23.

PITCH.—The demand is falling off, and business is quiet. Prices remain unchanged at approximately 60s. to 62s. 6d. per ton f.o.b. East coast, and 65s. to 70s. f.o.b. London.

SULPHATE OF AMMONIA.—The demand is small; prices remain unchanged.

Current Prices

Chemicals

	per	£	s.	d.		£	s.	d.
Acetic anhydride	lb.	0	2	3	to	0	2	6
Acetone oil	ton	95	0	0	to	100	0	0
Acetone, pure	ton	105	0	0	to	110	0	0
Acid, Acetic, glacial, 99-100%	ton	70	0	0	to	72	0	0
Acetic, 80% pure	ton	53	0	0	to	54	0	0
Arsenic	ton	100	0	0	to	105	0	0
Boric, cryst	ton	69	0	0	to	70	0	0
Carbolic, cryst. 39-40%	lb.	0	0	6	to	0	0	6½
Citric	lb.	0	2	7	to	0	2	9
Formic, 80%	ton	77	0	0	to	80	0	0
Gallic, pure	lb.	0	4	0	to	0	4	3
Hydrofluoric	lb.	0	0	8½	to	0	0	9
Lactic, 50 vol	ton	37	10	0	to	40	0	0
Lactic, 60 vol.	ton	42	10	0	to	45	0	0
Nitric, 80 Tw	ton	41	0	0	to	44	0	0
Oxalic	lb.	0	0	10	to	0	0	11
Phosphoric, 1.5	ton	55	0	0	to	57	0	0
Pyrogallic, cryst	lb.	0	8	0	to	0	8	3
Salicylic, Technical	lb.	0	1	0	to	0	1	2
Salicylic, B.P.	lb.	0	1	6	to	0	1	9
Sulphuric, 92-93%	ton	8	10	0	to	8	15	0
Tannic, commercial	lb.	0	3	6	to	0	3	9
Tartaric	lb.	0	1	9	to	0	1	10
Alum, lump	ton	18	0	0	to	18	10	0
Alum, chrome	ton	45	0	0	to	50	0	0
Alumino ferric	ton	9	0	0	to	9	10	0
Aluminium, sulphate, 14-15%	ton	15	0	0	to	16	0	0
Aluminium, sulphate, 17-18%	ton	18	0	0	to	19	0	0
Ammonia, anhydrous	lb.	0	2	2	to	0	2	4
Ammonia, .880	ton	43	0	0	to	45	0	0
Ammonia, .920	ton	30	0	0	to	32	10	0
Ammonia, carbonate	lb.	0	0	4	to	—		
Ammonia, chloride	ton	65	0	0	to	70	0	0
Ammonia, muriate (galvanisers)	ton	50	0	0	to	52	0	0
Ammonia, nitrate	ton	55	0	0	to	60	0	0
Ammonia, phosphate	ton	95	0	0	to	100	0	0

	per	£	s.	d.		£	s.	d.
Ammonia, sulphocyanide	lb.	0	3	0	to	0	3	0
Amyl acetate	ton	420	0	0	to	425	0	3
Arsenic, white, powdered	ton	52	0	0	to	55	0	0
Barium, carbonate, 92-94%	ton	12	10	0	to	13	0	0
Barium, chlorate	lb.	0	0	11	to	0	1	0
Chloride	ton	20	0	0	to	21	0	0
Nitrate	ton	50	0	0	to	52	0	0
Barium Sulphate, blanc fixe, dry	ton	30	0	0	to	31	0	0
Sulphate, blanc fixe, pulp	ton	16	10	0	to	17	0	0
Sulphocyanide, 95%	lb.	0	1	6	to	0	1	0
Bleaching powder, 35-37%	ton	20	0	0	to	21	0	0
Borax crystals	ton	34	0	0	to	36	0	0
Calcium acetate, Brown	ton	12	0	0	to	13	0	0
,, Grey	ton	19	0	0	to	21	0	0
Calcium Carbide	ton	29	0	0	to	30	0	0
Chloride	ton	12	10	0	to	13	0	0
Carbon bisulphide	ton	65	0	0	to	67	0	0
Casein, technical	ton	90	0	0	to	92	0	0
Cerium oxalate	lb.	0	3	9	to	0	4	0
Chromium acetate	lb.	0	1	2	to	0	1	4
Cobalt acetate	lb.	0	11	6	to	0	12	6
Oxide, black	lb.	0	16	0	to		—	
Copper chloride	lb.	0	1	3	to	0	1	6
Sulphate	ton	35	0	0	to	37	0	0
Cream Tartar, 98-100%	ton	130	0	0	to	135	0	0
Epsom salts (*see* Magnesium sulphate)								
Formaldehyde 40% vol	ton	110	0	0	to	112	10	0
Formusol (Rongalite)	lb.	0	4	9	to	0	5	1
Glauber salts, commercial	ton	6	0	0	to	7	0	0
Glycerine, crude	ton	70	0	0	to	72	10	0
Hydrogen peroxide, 12 vols.	gal.	0	2	8	to	0	2	9
Iron perchloride	ton	45	0	0	to	50	0	0
Iron sulphate (Copperas)	ton	4	0	0	to	4	5	0
Lead acetate, white	ton	50	0	0	to	52	0	0
Carbonate (White Lead)	ton	43	0	0	to	46	0	0
Nitrate	ton	55	0	0	to	57	0	0
Litharge	ton	38	10	0	to	40	0	0
Lithopone, 30%	ton	30	0	0	to	32	10	0
Magnesium chloride	ton	18	0	0	to	19	0	0
Carbonate, light	cwt.	2	15	0	to	3	0	0
Sulphate (Epsom salts commercial)	ton	10	10	0	to	11	10	0
Sulphate (Druggists')	ton	18	10	0	to	19	10	0
Manganese, Borate	ton	70	0	0	to	75	0	0
Sulphate	ton	75	0	0	to	78	0	0
Methyl acetone	ton	95	0	0	to	100	0	0
Alcohol, 1% acetone	ton	145	0	0	to	150	0	0
Nickel sulphate, single salt	ton	60	0	0	to	62	0	0
Nickel ammonium sulphate, double salt	ton	62	0	0	to	64	0	0
Potash, Caustic	ton	44	0	0	to	49	0	0
Potassium bichromate	lb.	0	0	9½	to		—	
Carbonate, 90%	ton	50	0	0	to	55	0	0
Chloride	ton	38	0	0	to	40	0	0
Chlorate	lb.	0	0	8½	to	0	0	9
Meta bisulphite, 50-52%	ton	130	0	0	to	140	0	0
Nitrate, refined	ton	50	0	0	to	52	0	0
Permanganate	lb.	0	2	0	to	0	2	3
Prussiate, red	lb.	0	2	6	to	0	2	9
Prussiate, yellow	lb.	0	1	6	to	0	1	7
Sulphate, 90%	ton	31	0	0	to	33	0	0
Salammoniac, firsts	cwt	3	15	0	to		—	
Seconds	cwt	3	10	0	to		—	
Sodium acetate	ton	35	0	0	to	37	10	0
Arsenate, 45%	ton	60	0	0	to	62	0	0
Bicarbonate	ton	10	10	0	to	11	0	0
Bichromate	lb.	0	0	7½	to	0	0	8
Bisulphite, 60-62%	ton	35	0	0	to	37	10	0
Chlorate	lb.	0	0	5½	to	0	0	5½
Caustic, 70%	ton	24	0	0	to	24	10	0
Caustic, 76%	ton	25	0	0	to	25	10	0
Hydrosulphite, powder, 85%	lb.	0	2	3	to	0	2	6
Hyposulphite, commercial	ton	22	0	0	to	24	0	0
Nitrite, 96-98%	ton	48	0	0	to	50	0	0
Phosphate, crystal	ton	25	0	0	to	27	0	0
Perborate	lb.	0	1	9	to	0	2	0
Prussiate	lb.	0	0	8	to	0	0	8½
Sodium Sulphide, crystals	ton	19	0	0	to	20	0	0
Sulphide, solid, 60-62%	ton	26	0	0	to	30	0	0
Sulphite, cryst	ton	15	0	0	to	16	0	0
Strontium carbonate	ton	85	0	0	to	90	0	0
Strontium Nitrate	ton	84	0	0	to	90	0	0
Strontium Sulphate, white	ton	8	10	0	to	10	0	0
Sulphur chloride	ton	42	0	0	to	44	10	0
Sulphur, Flowers	ton	19	0	0	to	19	10	0
Roll	ton	19	0	0	to	19	10	0
Tartar emetic	lb.	0	2	3	to	0	2	6
Tin perchloride, 33%	lb.	0	2	6	to	0	2	7
Tin Perchloride, solid	lb.	0	3	0	to	0	3	3
Protochloride (tin crystals)	lb.	0	1	8	to	0	1	9
Zinc chloride, 102 Tw.	ton	22	0	0	to	23	10	0
Chloride, solid, 96-98%	ton	60	0	0	to	65	0	0
Oxide, 99%	ton	45	0	0	to	47	10	0
Dust, 90%	ton	90	0	0	to	92	10	0
Sulphate	ton	21	10	0	to	23	10	0

Coal Tar Intermediates, &c.

		£	s.	d.		£	s.	d.
Alphanaphthol, crude	lb.	0	4	0	to	0	4	3
Alphanaphthol, refined	lb.	0	4	6	to	0	4	9
Alphanaphthylamine	lb.	0	3	0	to	0	3	3
Aniline oil, drums extra	lb.	0	1	7	to	0	1	8
Aniline salts	lb.	0	1	8	to	0	1	10
Anthracene, 85-90%	lb.		—		to		—	
Benzaldehyde (free of chlorine)	lb.	0	4	9	to	0	5	0
Benzidine, base	lb.	0	8	6	to	0	9	0
Benzidine, sulphate	lb.	0	9	0	to	0	9	6
Benzoic acid	lb.	0	2	3	to	0	2	6
Benzoate of soda	lb.	0	2	0	to	0	2	3
Benzyl chloride, technical	lb.	0	2	0	to	0	2	3
Betanaphthol benzoate	lb.	0	8	0	to	0	8	6
Betanaphthol	lb.	0	2	9	to	0	3	0
Betanaphthylamine, technical	lb.	0	9	6	to	0	10	0
Croceine Acid, 100% basis	lb	0	5	0	to	0	6	3
Dichlorbenzol	lb.	0	0	9	to	0	0	10
Diethylaniline	lb.	0	6	9	to	0	7	6
Dinitrobenzol	lb.	0	1	5	to	0	1	6
Dinitrochlorbenzol	lb.	0	1	5	to	0	1	6
Dinitronaphthaline	lb.	0	1	6	to	0	1	8
Dinitrotoluol	lb.	0	1	8	to	0	1	9
Dinitrophenol	lb.	0	3	0	to	0	3	3
Dimethylaniline	lb.	0	4	0	to	0	4	3
Diphenylamine	lb.	0	4	6	to	0	4	9
H-Acid	lb.	0	10	0	to	0	10	6
Metaphenylenediamine	lb.	0	5	9	to	0	6	0
Monochlorbenzol	lb.	0	0	10	to	0	1	0
Metanilic Acid	lb.	0	7	6	to	0	8	0
Monosulphonic Acid (2:7)	lb.	0	7	6	to	0	8	0
Naphthionic acid, crude	lb.	0	4	0	to	0	4	3
Naphthionate of Soda	lb.	0	4	3	to	0	4	6
Naphthylamin-di-sulphonic-acid	lb.	0	5	0	to	0	5	6
Nitronaphthalene	lb.	0	1	5	to	0	1	6
Nitrotoluol	lb.	0	1	4	to	0	1	5
Orthoamidophenol, base	lb.	0	18	0	to	1	0	0
Orthodichlorbenzol	lb.	0	1	1	to	0	1	2
Orthotoluidine	lb.	0	2	3	to	0	2	6
Orthonitrotoluol	lb.	0	0	10	to	0	1	0
Para-amidophenol, base	lb.	0	12	6	to	0	13	0
Para-amidophenol, hydrochlor	lb	0	13	0	to	0	13	6
Paradichlorbenzol	lb.	0	0	7	to	0	0	8
Paranitraniline	lb.	0	4	3	to	0	4	6
Paranitrophenol	lb.	0	2	9	to	0	3	0
Paranitrotoluol	lb.	0	5	9	to	0	6	0
Paraphenylenediamine, distilled	lb.	0	13	6	to	0	14	6
Paratoluidine	lb.	0	7	6	to	0	8	0
Phthalic anhydride	lb.	0	3	9	to	0	4	0
Resorcin, technical	lb.	0	7	6	to	0	8	0
Resorcin, pure	lb.	0	6	9	to	0	7	0
Salol	lb.	0	3	6	to	0	3	9
Sulphanilic acid, crude	lb.	0	1	4	to	0	1	6
Tolidine, base	lb.	0	8	6	to	0	10	0
Tolidine, mixture	lb.	0	2	9	to	0	3	0

The Chemical Trade

The monthly record of the *Manchester Chamber of Commerce* in a review of the state of trade, says : " The chemical trade is dull. The users of its products are on short time, and for such trade as there is going, foreign competition is experienced. There has been more inquiry for export, but the miners' stoppage has put difficulties in the way of business being arranged. Sulphate of ammonia, tartaric acid, yellow prussiates of potash and soda, citric acid, borax, and boracic acid have been in better demand, but tar products have been difficult to sell."

At a recent meeting of the Société de Chimie Industrielle, M. Georges Mignonac, discussing industries rising from the war, referred to that of obtaining ALCOHOL FROM CALCIUM CARBIDE which is being conducted on a large scale by a Swiss Company. The acetylene from the calcium carbide is converted into acetic acid and ethylidene acetate, then reduced to alcohol. The cost of making the alcohol by one of the procedures employed, starting from the acetylene, is said to be about 0 fr. 60 per litre.

Company News

SANITAS CO.—A dividend of 10½d. per share on the preference shares is payable on June 1.

BENZOL BY-PRODUCTS.—A dividend of 1s. 2d. per share on the preference shares is payable on May 24.

NEW PACCHA & JAZPAMPA NITRATE.—The profit for 1920, after charging all costs of manufacture, was £7,825, and £2,318 was brought forward. Debentures redeemed and interest, &c., absorb £3,689, and from balance remaining it is proposed to pay a dividend of 8 per cent., against 5 per cent. previous year; £959 forward.

BRUNNER, MOND & CO.—The company announce that letters of allotment and regret have been posted in resepct of the recent issue of 2,500,000, 7½ per cent. cumulative preference shares. The issue was heavily over-subscribed in spite of the early closing of the lists. A Stock Exchange announcement states that the following securities have been ordered to be quoted in the Official List:—1,800 ordinary shares of £1 each, fully paid; and 1,500,000, 7 per cent. cumulative preference shares of £1 each, fully paid.

NITRATE RAILWAYS.—The net receipts of the Nitrate Railways for 1920 amounted to £250,777, against £95,791 for 1919, and, adding the sum brought forward, interest, &c., the net revenue was £314,661, against £164,697. From this is deducted taxes and depreciation, £16,085; expenditure on new sidings and buildings, £7,225; and provision for additions and renewals of locomotives and rolling stock, £75,000; leaving £216,351. The directors recommend a final dividend of 3½ per cent. on the ordinary shares, making 7 per cent. for the year, against nil, and £100,431 is carried forward.

ENGLISH CHINA CLAYS.—The profit of English China Clays, Ltd., for 1920, after providing for depreciation and taxation, was £149,766 (against £74,980 in 1919), while £2,942 was brought in. The balance of preliminary expenses, £14,966, is written off; and £2,535, being interest to vendors to date of completion, has been paid. It is proposed to pay a final dividend on the ordinary shares of 5 per cent., making 7½ per cent. for the year, payable in two equal instalments (June 1 and October 1 next); £10,000 (against £5,000) is placed to reserve, and £11,752 is carried forward. In 1919 the dividend was 5 per cent.

CORNISH KAOLIN, LTD.—The company has been offering for subscription 131,780 shares of 10s. each at par, payable 2s. on application, 2s, on allotment, 2s. on August 1, 2s. on November 1, and 2s. on February 1, 1922. The company was formed, the prospectus states, to acquire and develop china clay deposits on an area of 1,180 acres held under a 60 years' lease from 1911, situated west of the Warleggan River in the parishes of Cardinham and Warleggan, Cornwall, and a Dry at Bodmin Road Station and a pipe line to connect with its clay pits on Bodmin Moor. It commenced production just prior to the war, which, naturally, restricted the output, but this was sufficient to establish a market for the clay and demonstrate the value of the property. Practically the whole of the company's issued shares have recently been acquired by the Sons of Gwalia, Ltd., East Pool & Agar, Ltd., and Tehidy Minerals, Ltd., with a view to energetic working on a larger scale with the use of improved methods of treatment, and with this object, a new board has been formed, and the general management placed in the hands of Messrs. Bewick, Moreing & Co., with Mr. R. M. Richards as superintendent.

ANGLO-CHILIAN NITRATE & RAILWAY.—The profit for 1920 amounted to £282,152, after providing for income tax, service of mortgage bonds, and all other charges, reserve against depreciation in investments, the transfer of £25,000 to renewals account, and £150,000 to depreciation and general reserve. The sum of £153,472 was brought in, making £435,624. There will be a further distribution of 15s. per share, free of tax, payable May 26, making 25 per cent., free of tax, for the year, and leaving to be carried forward £210,624, subject to Corporation Profits Tax. The expenditure in maintaining the nitrate and iodine plants in working order has been charged to the cost of the 1,745,000 quintals of nitrate produced. An extraordinary general meeting will be held at the conclusion of the ordinary general meeting to consider the advisability of splitting the shares, as well as a slight alteration of the articles as regards directors' travelling expenses. Meeting, Winchester House, May 24, 11.30 a.m.

Chemical Trade Inquiries

The following inquiries, abstracted from the "Board of Trade Journal," have been received at the Department of Overseas Trade (Development and Intelligence), 35, Old Queen Street, London, S.W.1. British firms may obtain the names and addresses of the inquirers by applying to the Department (quoting the reference number and country), except where otherwise stated.

LOCALITY OF FIRM OR AGENT.	MATERIALS.	REF. NO.
Canada ...	Bleached sulphite wood pulp. Enquiries at the Canadian Government Trade Commissioner's Office, Portland House, 73, Basinghall Street, London, E.C.2.	—
Wellington ...	Glassware	602
British Honduras (Belize)	Soap; drugs; jute bags	604
Milan ...	Vulcanising plant; machinery for the production of rubber articles	612
Brazilian ...	Chemical products...	620
Egypt ...	Glass; tar. Replies to the Inspecting Engineer, Egyptian Government, Queen Anne's Chambers, Westminster, London, S.W.1.	—
Bridgetown, Barbadoes	Paints	624
Renmark ...	Scientific apparatus and supplies; scientific glassware	629

Tariff Changes

CANADA.—A new classification of hard soap (not being whale oil soap or Castile soap) for Customs Duty is now in operation.

EGYPT.— A new rate of import duty (8 per cent. *ad valorem*) is imposed on charcoal. Benzine and mineral lubricating oil is subject to a similar duty of 15 per cent.

TRINIDAD AND TOBAGO.—The text of a new Customs Tariff in which increased preference is notified for British goods was published in the *Board of Trade Journal* (May 12, pp. 533-6). Among the goods mentioned are explosives; asphalt of all kinds, including pitch and tar; calcium carbide; and chemicals, other kinds. A second schedule exempts from duty the following articles: Coal, coke and patent fuel; lime; manures of all kinds, insecticides, fungicides, vermin killers, sulphate of ammonia, nitrate of soda and other substances which the Collector of Customs is satisfied are imported for use as manures, &c.; scientific apparatus, utensils, instruments and preparations, including absolute alcohol for preserving purposes, imported exclusively for scientific investigation in colleges, &c., and not for sale or exchange; and the tanning and dyeing materials: divi-divi, logwood and mangrave and other bark.

GERMANY.—Earth wax (ozokerite), crude, also melted, and bituminous earth wax may be imported without licence. No licence is required for the export of thickened sulphite dyes; ozokerite, bituminous earth wax; soluble glass and various other soaps, oils and liquid greases saponified by means of alkalis; turkey-red oil; soap substitutes; copper sulphate; cryolith; artificial resins, and tanning extracts.

POLAND.—The following goods are temporarily exempt from Customs Import Duty: Bones prepared with sulphuric acid, fertilising compositions and mixtures; calcined bones and bone ash; mineral superphosphates; ground graphite; metallic antimony; nitrate of ammonia; ammonium sulphate; glauber salt; sulphuric, nitric and hydrochloric acids; and dye earths (Cassell Verona). Reduced Customs Duties are notified on glass globes, tubes and rods for the manufacture of electric lamps; sulphide of sodium; hydrosulphate of soda; nitrate of thorium, of cerium, of beryllium, of aluminium, and of magnesium; nitrogenous and amylaceous substances of an aromatic nature; naphthols and sulphonic derivatives; hydrosulphate of lime; and sulphuric ether.

ROUMANIA.—Export taxes on salt, charcoal and natural bitumen in any form (including mastic) are modified. The tax in lei per waggon of 10 metric tons on these products is 800, 1,500, and 2,000 respectively.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for any errors that may occur.

London Gazette

Partnership Dissolved

TAYLOR, H. C., and ATKINSON, J. A., carrying on business as chemical and colour merchants, 34A and 38, Lucy Street, Hulme, Manchester, under the style of Taylor & Atkinson, by mutual consent, as and from January 31, 1921. All debts will be received and paid by H. C. Taylor.

Notices of Intended Dividends

ROBINSON, W., The Woodman Inn, Hartley Street, Dewsbury, York; ROBINSON, T., Crossley's Terrace, Streetside, Ossett, and WIGHTMAN, J., 4, Lawson Street, Eastborough, Dewsbury, carrying on business in co-partnership under the style of Wilson, Robinson & Son, Albion Dyeworks, Batley Carr, Batley, Dewsbury, May 28, 1921. W. Durrance, Official Receiver, 12, Duke Street, Bradford.

ROBINSON, W. (separate estate), The Woodman Inn, Hartley Street, Dewsbury, York; ROBINSON, T., Crossley's Terrace, Streetside, Ossett, and WIGHTMAN, J., 4, Lawson Street, Eastborough, Dewsbury, carrying on business in co-partnership with T. Robinson and J. Wightman, under the style of William Robinson & Son, Albion Dyeworks, Batley Carr, Batley, York, Dewsbury, May 28, 1921. W. Durrance, Official Receiver, 12, Duke Street, Bradford.

Company Winding Up

TRIPLEX SAFETY GLASS Co., LTD., 1, Albemarle Street, London, High Court of Justice. Date of Order, May 12, 1921. Date of Presentation of Petition, April 8, 1921.

Companies Winding Up Voluntarily.

ABBOTT GLASS CO., LTD., creditors' claims on or before June 24, 1921, to the Liquidator, R. F. W. Fincham, 3, Warwick Court, Gray's Inn, London, W.C. 1.

JOHN BELL and CROYDON, LTD. (in voluntary liquidation).—A meeting of creditors will be held at Sardinia House, Sardinia Street, Kingsway, London, on Thursday, May 26, 1921, at 12 noon. S. Cole, Liquidator. NOTE.—This notice is given to comply with the Companies Acts. All liabilities will be paid in full.

Liquidators' Notices

CARDIFF HEMATITE IRON ORE CO., LTD., creditors' claims on or before June 15, 1921, to the Liquidator, E. T. Granger, 3, Dock Chambers, Cardiff.

LOMAS GELATINE WORKS, LTD., a general meeting of members will be held at The Abbey Stores, Finewell Street, Plymouth, on Friday, June 17, 1921, at 3.30 p.m. H. Kidson, liquidator.

ROCKCASTLE CHEMICAL CO., LTD., a meeting of creditors will be held at the Company's Office, 17, Philpot Lane, Fenchurch Street, London, E.C., on Friday, May 20, 1921, at 3 p.m. A. Yearsley, liquidator.

Edinburgh Gazette

THE CENTRAL CHEMICAL CO., Victoria Works, Bairds Brae, Rockvilla, Possil Park, Glasgow. These estates were sequestrated on May 13, 1921. Meeting to elect Trustee and Commissioners May 25, 1921, Faculty Hall, St. George's Place, Glasgow.

Mortgages and Charges

*[NOTE.—The Companies Consolidation Act, of 1908, provides that every Mortgage or Charge, as described therein, created after July 1, 1908, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its Annual Summary, specify the total amount of debts due from the Company in respect of all Mortgages or Charges which would, if created after July 1, 1908, require registration. The following Mortgages and Charges have been so registered. In each case the total debt, as specified, in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced since such date.]*

BRITON FERRY CHEMICAL & MANURE CO., LTD.—Reg. May 4, £150,000 debenture stock secured by Trust Deed dated May 2, 1921 (filed under sec. 93 (3) of the Companies (Consolidation) Act, 1908), present issue £130,000; charged on land, buildings, &c., at Llanelly, Briton Ferry and Llansamlet, also general charge. *Nil. April 7, 1921.

COVENTRY METAL & IRON CO., LTD. (late H. A. TAYLOR & CO., LTD.).—Reg. May 2, £30,000 debenture, to D. J. H. Cunnick and Others, 15, Bishopsgate, E.C.; general charge. *Nil. January 14, 1921.

FORSTERS GLASS CO., LTD., St. Helens.—Reg. May 2, charge to London County Westminster & Parr's Bank, Ltd., securing all moneys due or to become due to the Bank; charged on works, premises, land, &c., at St. Helens. *Nil. July 3, 1920.

LEVER BROS., LTD., Port Sunlight.—Reg. May 4, charge under Land Transfer Acts by way of collateral security (supplemental to Trust Deed registered April 13, 1921), securing all moneys due or to become due under Trust Deed; charged on certain properties at Bebington and London. *Nil. March 25, 1920.

Bill of Sale

[The undermentioned information is from the Official Registry. It includes Bills of Sale registered under the Act of 1882 and under the Act of 1878. Both kinds require re-registration every five years. Up to the date the information was obtained it was registered as given below; but payment may have been made in some of the cases, although no notice had been entered on the Register.]

BRIGGS, A. F., 12, Paultow Avenue, St. John's Lane, Pedminster, chemist's dispenser. Filed May 13, £50.

County Court Judgments

[NOTE.—The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for damages or otherwise, and the result of bona-fide contested actions. But the Registry makes no distinction of the cases. Judgments are not returned to the Registry if satisfied in the Court books within twenty-one days. When a debtor has made arrangements with his creditors we do not report subsequent County Court judgments against him.]

BARLOW, — St. Columb, chemist. £20 7s. 1d. March 23.

HILL, B., South Coast Lubricating Oil Co., 17, King's Terrace, Southsea. £10 15s. 6d. April 4.

BROOKS, T. H., Shipping Office, Hitchin, wholesale druggist. £14 19s. 2d. March 23.

CASSON CHEMICAL CO., LTD., 44, Westbourne Grove, chemists. £14 18s. 11d. April 1.

CASSON CHEMICAL CO., LTD., 44A, Westbourne Grove, chemical manufacturers. £15 9s. 3d. April 5.

CASSON CHEMICAL CO., LTD., Newton Road, Westbourne Grove, chemists. £21 10s. 3d. April 1.

EDWARDS, J. M., 311, Fulham Palace Road, London, S.W., chemist. £10 4s. 10d. April 5.

RUSSELL, G. H., 33, High Road, Willesden Green, chemist. £66 17s. 2d. March 21.

WOOLGAR, P. M., Mapesbury Works, Willesden Lane, acetylene welder. £12 3s. April 4.

NEWMAN, A. P., 51, Thomas Street, Barry Docks, chemist. £16 9s. 3d. March 31.

New Companies Registered

The following list has been prepared for us by Jordan & Sons, Ltd., company registration agents, 116 and 117, Chancery Lane, London, W.C.2:—

BAKER (CHARLES) & SONS (PAPER MAKERS), LTD., 77a, Queen Victoria Street, E.C. Makers of pulp, paper, wax, &c. Nominal capital, £50,000 in 50,000 shares of £1 each. Directors: C. Baker, C. G. Baker, R. Jacob, E. R. Rayner, B. T. S. Bagnall. Qualification of directors, one share.

HASWELL (C. H.) & CO., LTD., 166 and 168, Morning Lane, Hackney, N.E. Glass manufacturers. Nominal capital, £3,000 in 3,000 ordinary shares of £1 each. Directors: C. H. Haswell, L. P. N. Keshan. Qualification of directors, 500 shares.

WINDRIDGE (A. H.), LTD. Chemists, druggists and dry-salters. Nominal capital, £1,000 in 1,000 shares of £1 each. Directors: A. H. Windridge, J. T. Cattell, P. H. Peyton. Qualification of directors, one share.

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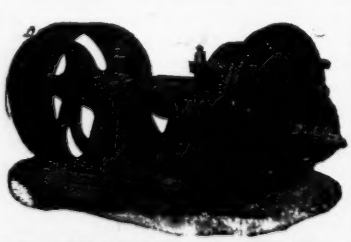

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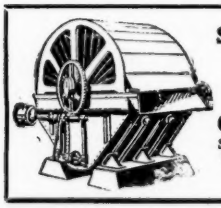

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